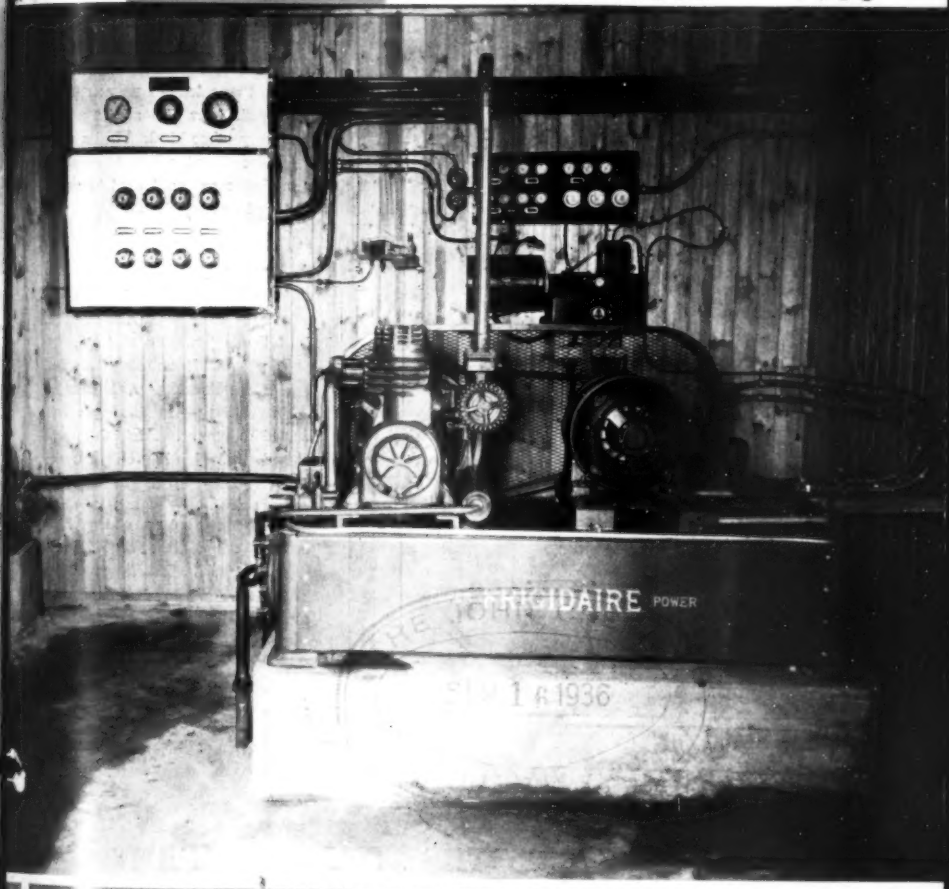
The Refrigeration Service Engineer

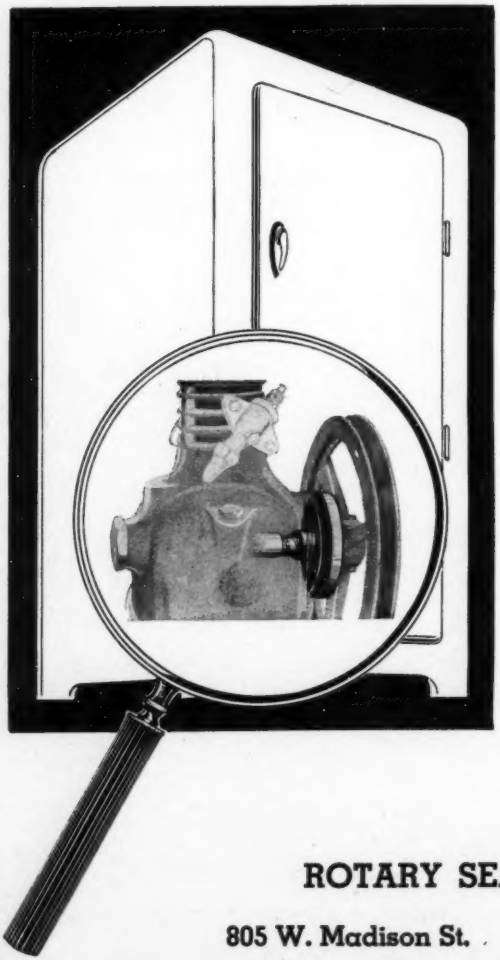
SEPTEMBER • 1936



SEP 16 1936

Charging Units and Filling Service Cylinders • The Frigidaire Sealed Unit Relay • Rebuilding G.E. Hermetics

Avoid breakdowns due to faulty compressor seals



SOME Service Engineers estimate that 60% of their repair jobs are due to worn or defective seals—others say 75%. The fact remains—more refrigerator repair jobs are sealing jobs than any other kind. That's why the smart Service Engineer picks a replacement seal that is satisfactory in every detail.

The ROTARY SEAL REPLACEMENT UNIT is profitable for you to install because it's worth the price you charge for installation. And that's just one of its favorable points. It can be installed quickly and easily—no lapping—no machining—no tearing down the compressor. And the time saved on the job leaves you more time for other jobs.

Leading jobbers everywhere handle a full line of ROTARY SEAL REPLACEMENT UNITS—precision built to fit all popular makes of household compressors.

Rotary Seal Replacement Units are fully covered by U. S. and foreign patents.

ROTARY SEAL COMPANY

805 W. Madison St. CHICAGO, ILL.

Important News - ALCO *again scores a hit*

THE SM44

MAGNETIC STOP VALVE

FOR METHYL CHLORIDE OR FREON LIQUID OR SUCTION

HIGH LIQUID CAPACITY AT MINIMUM PRESSURE DIFFERENCE

RE-FRIG-ERANT	Capacity in Tons of Refrigeration with CH_3CL and F12, Based on 1° Subcooled Liquid Discharge, and Pressure Differences Between Valve Inlet and Outlet as Follows:					
	1#	2#	3#	4#	5#	6#
CH_3CL	32.4	40.8	47.4	53.2	58.4	63.2
F12	16.2	20.4	23.7	26.6	29.2	31.6

To prevent flashing of liquid refrigerant beyond valve, provide subcooling to compensate for pressure drop.

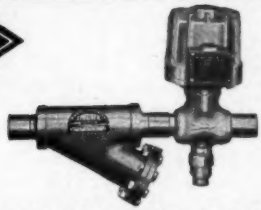
- A packless, heavy duty, tight closing, electrically operated, magnetic stop valve for liquid or suction line applications.
- With solder line connections for direct solder of 7/8" O.D. tube or pipe; or for 1", 1 1/8", 1 3/8", or larger O.D. tube or pipe by using standard solder type couplings.
- Equipped with manual operating stem for use in case electrical current is interrupted.
- Available for all usual voltages and frequencies as specified.
- Regularly equipped with 8954A Filter unless otherwise specified.

FOR FURTHER DETAILS, ASK FOR BULLETIN 141B.

ALCO

List Price Complete

$49.00



As Furnished Complete with Standard Equipment.

Specify SM441 for Liquid Line Application.

Specify SM442 for Suction Line Application.

Specify Voltage and Frequency in All Cases.

THERE IS AN ALCO SUPPLY HOUSE NEAR YOU

ALCO VALVE CO., INC.

2626 Big Bend Blvd., ST. LOUIS, MO., U. S. A.

Baltimore, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Ft. Wayne, Houston, Indianapolis, Kansas City, Los Angeles, Memphis, New Orleans, New York, Oklahoma City, Philadelphia, Pittsburgh, St. Paul, St. Louis, San Antonio, San Francisco, Toronto

THERMO VALVES—EXPANSION VALVES—MAGNETIC VALVES—HIGH PRESSURE FLOAT VALVES—LOW PRESSURE FLOAT SWITCHES—FOR THE AUTOMATIC CONTROL OF REFRIGERATION.

RIGHT DOWN THE LINE

NEW C-H Replacement Control Has- EVERY FEATURE YOU WANT

The famous Cutler-Hammer Control, time-tested on a million refrigerators . . . is now available as a replacement unit.

Here are a few reasons for its popularity: Sure protection to motor, wide-range cold control, modern appearance, proved performance.

And here are Service Facts for the Service Man: 4 MODELS FIT NEARLY EVERY BOX. With two temperature models in 24" and 48" tubes or two pressure models for sulphur dioxide and methyl chloride systems—you're equipped to service 99% of the boxes in your community . . . with smaller stock, less money tied up, faster turnover, bigger returns, no shelf losses.

EASIER TO INSTALL; EASIER TO ADJUST. Unit mounts either horizontal or vertical, just two screws to insert. Differential and range adjustment made easily.

Every day more of the millions of old refrigerators move into the zone where they need repairs. With C-H Control that fits 99% of these boxes, that provides every advantage, it is easy to get the customer's O. K. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1363 St. Paul Avenue, Milwaukee, Wisconsin.

Send **NOW**

For full facts on this profitable item. FREE Booklet gives all information, diagrams, etc., also Replacement Control for popular-make Beverage Coolers and Ice Cream Cabinets. Same simple, reliable, proven mechanism. Call on your nearest jobber for stock.

CUTLER-HAMMER

REFRIGERATION CONTROL FOR REPLACEMENT SERVICE

Frigidaire's DULUX SURFACE RENEWER

Try This Improved Refrigerator Cleaner, for Easier—Quicker—Better Results

LOW PRICE

• An improved surface renewer that does everything in one operation. Cleans, polishes, waxes. Gives a rich, glossy, long-lasting finish . . . a high luster that resists dust and finger prints. For all refrigerator enamel and Duco finishes, hardware fittings, metals of all kinds, glassware, furniture, automobiles, etc. Easily applied, complete instructions on each can. Available in pint and gallon sizes at any of Frigidaire's 49 distributing points.

Extremely low price. Order a supply at once.

GENUINE FRIGIDAIRE PRECISION-BUILT PARTS

USE GENUINE FRIGIDAIRE PRECISION-BUILT PARTS

ANACONDA COPPER REFRIGERATOR TUBES

Coils are wrapped in moisture-resistant paper which protects the finish of the tubes.

Cutaway view of inside of tube. Note the bright inside surface.

Specially deoxidized... thoroughly dehydrated ...unusually soft

There are three outstanding reasons why Anaconda Copper Refrigerator Tubes enable you to do a first-class installation job.

1—**Deoxidized.** Anaconda Copper Refrigerator Tubes are *specially* deoxidized to increase their corrosion resistance.

2—**Dehydrated.** These high quality tubes are thoroughly dehydrated. They are manufactured according to A. S. T. M. specifications by methods which assure *unusually bright, clean inside surfaces.*

3—**Soft.** Then, too, Anaconda Copper Refrigerator Tubes are unusually soft. They may be easily bent and will *flare without cracking.*

The leading refrigerator manufacturers' specifications for tubes to be used in the installation work are met by Anaconda Copper Refrigerator Tubes. When *you* install them, you give the purchaser full value. The result is increased good-will for your business.

• • •

Anaconda Copper Refrigerator Tubes are carried in stock by leading distributors of refrigerator parts.

ANACONDA
from mine to consumer

B-6418A

FRENCH SMALL TUBE *Branch*

THE AMERICAN BRASS COMPANY • *General Offices:* WATERBURY, CONN.

The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of

REFRIGERATION UNITS *and* OIL BURNERS

VOL. 4 SEPTEMBER, 1936 NO. 9

COVER

ILLUSTRATED on the front cover of this issue of THE REFRIGERATION SERVICE ENGINEER is an installation made in faraway Oslo, Norway, by Mr. Reidar Andersen, in what is said to be one of the largest canning plants in the world.

This 10-hp. Frigidaire installation is used for the cooling of fresh fish in the plant of Christian Bjelland & Co., Stavanger, Norway. It is interesting to note the workmanlike manner in which the installation is made.

Table of Contents

Charging Units and Filling Service Cylinders, *by L. K. Wright* 7
The Frigidaire Sealed Unit Relay, *by Walter Christie* .. 12
Shop Service and Rebuilding G. E. Hermetic Units (Third Article), *by Edw. D. Geiser* 17
The Question Box
Repairing Compressors 19
Reclaiming SO_2 19
Frigidaire Expansion Valve 20
Nizer Information 21
Adding Gas to 1927 G. E. 21
Norge Information 21
Crosley Beer Cooler 23
Williams Ice-O-Matic 23
A Complete Tool Kit is the First Need for Good Service Work, *by Sam Robinson* 24
Servicing the Fairbanks-Morse Refrigerator (Third Article) 26
As It Should Be (Editorial) 37
Temperature Relations Between Evaporator, Refrigerator and Room, *by Geo. H. Clark* 38
Memphis Invites You 45

PUBLISHED MONTHLY BY

NICKERSON & COLLINS COMPANY

433-435 NORTH WALLER AVE., CHICAGO, ILL.

EASTERN OFFICE: 149 BROADWAY, NEW YORK CITY

Publishers for 45 years of Technical Books and Trade Journals Serving the Refrigeration Industries.
Subscription: United States $2.00 per year. Single copies 25c. All other countries $3.00 per year.

Copyright, 1936, by Nickerson & Collins Co., Chicago

THE NEW DURAFLEX *Bellows*

Bellows have for many years been the very symbol of accuracy and reliability in all types of valves and controls requiring a flexible member.

Refrigeration systems impose a more severe service on bellows than most other applications.

Detroit Lubricator Company has pioneered in the manufacture of both bellows and Refrigeration controls.

It is not surprising then that Detroit Lubricator Company should develop a new bellows capable of withstanding the rigors of refrigeration service. This is the new Duraflex Bellows.

Extensive laboratory tests showed the superiority of Duraflex over anything available. Field experience has now proved the ability of Duraflex to give many years of reliable service under conditions that may be even abnormally severe.

DETROIT LUBRICATOR COMPANY DETROIT, MICH. U. S. A.
5900 Trumbull Avenue

NEW YORK, N. Y.—60 West 40th St. • CHICAGO, ILL.—816 S. Michigan Ave.
LOS ANGELES, CALIF.—320 Crocker Blvd.

DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

Canadian Representative—RAILWAY AND ENGINEERING SPECIALTIES LIMITED, Montreal, Toronto, Winnipeg

The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 4, NO. 9 CHICAGO, SEPTEMBER, 1936 $2.00 per Annum

Shop Methods and Data

Charging Units and Filling Service Cylinders

The Use of Standard and Special Time Saving Apparatus for Use in Shops

By L. K. WRIGHT, A.S.R.E.

THE larger service stations generally employ somewhat more elaborate apparatus for the filling of service cylinders and the charging of units than the more modest shops. In all probability, the smaller shop makes use of a cylinder stand to hold the main refrigerant vessel for the charging of small service cylinders.

Refrigerants are purchasable at lowest cost in the large size cylinders and where any fair quantity is used the saving represented is considerable. Hence, even the smallest service station will find use for a simple charging stand.

A good hook-up for filling service cylinders is shown in Fig. 8. This appears to be the standard with the majority of small organizations. It makes use of a wooden cylinder stand, so the main drum can be supported in a tilted position.

An iron yoke piece is generally used to hold the cylinder neck, as indicated in the sketch, although a piece of hard wood carved to proper shape so as to hug the cylinder neck will serve admirably.

One glaring mistake made by shop men in the construction of not only charging stands but work benches as well, is to use flimsy lumber and to merely tack the parts together. Stands should be made of heavy timber, preferably bolted together. In the event of the lumber drying out the bolts can be pulled up and the entire stand made as rigid as when first constructed. A poorly made stand may become a hazard and will probably require attention just when every minute is required to care for a rush of business.

Simple Apparatus for Cylinder Charging

The stand previously mentioned is required to hold the refrigerant cylinder. Service cylinders (or units) are placed on a platform scale, or even suspended from a spring scale, so the quantity of refrigerant placed in each cylinder or unit can be accurately determined.

It is important to bear in mind the I.C.C. regulations concerning charging where cylinders are to be shipped and where safety is

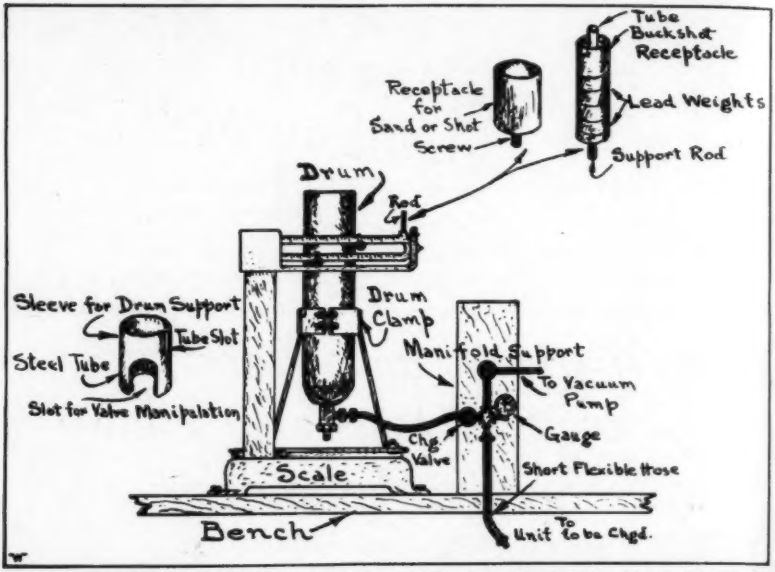


FIG. 1. METHOD OF CHARGING CYLINDERS WHERE A NUMBER ARE FILLED REGULARLY

concerned. Overcharging is dangerous in the extreme, not only to the negligent worker but to other persons as well and should not be countenanced in a properly run shop.

Where a considerable number of service cylinders are charged each day, or at one time, it is best to improve on the simple hook-up shown in Fig. 3, by inserting a tee in the charging line. A valve is inserted in the side opening of this tee, so that air can be blown from the charging line and cylinder. Be sure to coil the vent or gas line so as to take the "spring" out of it, otherwise incorrect weighing is certain to result.

The vent or gas line and its valve are shown in dotted outline in the sketch. If desired, the charging line and part of the vent or gas line can be of flexible tubing, in which case there is no need to coil them, as in the prescribed method employed where ¼ inch copper tubing is used.

Service Cylinders

If the service cylinders are empty it is best to give each a "shot" of liquid refrigerant. The liquid will drop into the cylinder and vaporize. The gas or vent valve can then be opened. This will result in any air in the cylinder being pushed out by the expansion of the heavier refrigerant vapor.

Service cylinders, if possible, should never be entirely emptied, because the service or shop man may crack the valve to ascertain the gas contained in the cylinder. If emptied and under a vacuum, air will be drawn into the cylinder.

Refrigerants exert a peculiar action on steel. They appear to clean the surface to such an extent that when atmospheric air, with its normal moisture content, is admitted, the surface immediately "dusts" with rust. It is important to exclude air, not only for the reason given previously, but also because of the reaction of the moisture content with sulphur dioxide (forming sulphurous acid), the freezing of moisture on the seats of expansion valves and plugging of throttle devices, besides giving high head pressures with consequent motor overloading, long operating periods and high electric bills.

Should a cylinder be empty and suspected of containing air it should be blown out before filling with refrigerant. Better still, it should first be given a "shot" of refrigerant and then thoroughly evacuated with an old compressor.

Painting the cylinders with different colors or providing painted bands will prevent cylinders from being refilled with another refrigerant as well as eliminating any chance of the service man charging a system with the wrong refrigerant.

Apparatus for Charging Units

Where a number of units as well as service cylinders are charged each day the apparatus shown in Fig. 1 is of value. Its use will save time and give accurate charging. It is somewhat more complicated than the previous simple apparatus but it will result in a greater saving in time where used.

The platform scale is best mounted on the work bench and bolted down. Make sure the bench is perfectly level. A drum or cylinder clamp of strap iron with three supporting legs must be provided to hold the drum in an upright position on the platform of the scale. In fastening the legs to the platform take care that the bolts do not interfere with the mechanism beneath.

A special sleeve of large pipe can be formed as shown at the left in Fig. 1, to supplement the clamp. A slot is provided to permit the use of a ratchet wrench on the valve stem of the cylinder.

Such a sleeve takes the weight of the cylinder and it is not necessary to pull up as tightly on the drum clamp. Its use is advocated, for with a sleeve it is a one man job to change and set a new drum in place, whereas two men are usually required where only the clamp is used.

Another slot must be provided in the sleeve to permit the charging line or tube to pass to the manifold board.

A charging or manifold board, held securely to the bench by a pair of angle irons or shelf brackets, should be used to hold the charging valves. A cross is best employed, as it simplifies the arrangement, as depicted

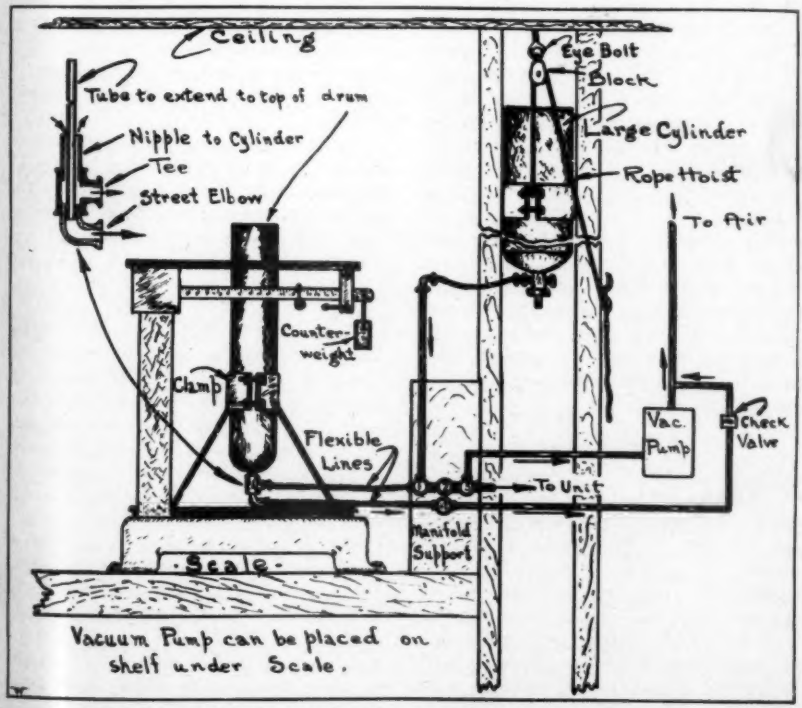


FIG. 2. METHOD OF CHARGING REFRIGERANT CYLINDERS FOR A LARGE SHOP

in the sketch. Of course, other arrangements using tees can be employed as well. One opening of the cross is provided to hold a compound gauge. Use a 30 inch V. to 60 lb. gauge for sulphur dioxide or Isobutane and a 30 inch V. to 150 lb. one for F-12 or methyl chloride.

The top opening of the cross may be led to a vacuum pump, such as an old or overhauled compressor, for evacuating systems or cylinders of all gas and air. A stop valve is inserted in this evacuation line as shown. Be sure to have the discharged gases from the pump lead to the open air to take care that the exit end is so located as not to constitute a menace or nuisance to others.

A flexible line, or a coiled piece of ¼ inch tubing is used to connect the main drum to the side opening of the cross, with a stop valve interposed.

The fourth or lower opening is used for the flexible line which is to be hooked up to the unit or cylinder to be evacuated and charged.

With such an arrangement ready for work the cylinder or unit can be connected to the flexible line. The charging valve is left closed. The drum or refrigerant cylinder valve may also be left open. The vacuum valve should be opened and the vacuum pump operated until a good vacuum is obtained.

It is advisable to pull as deep a vacuum as possible; never less than 25 inches. It will be found that some of the old rotary compressors, such as used on ethyl chloride jobs, form ideal evacuating machines for this purpose for while they do not make good pressure pumps they usually are capable of pulling deep vacuums.

Adjusting Scale

When a good vacuum is secured the vacuum valve should be closed and the vacuum pump stopped. Some shop men may want to place a tee in the line so that an old pressurestat set for, say, a 28 inch cut-out can be inserted and used to automatically stop the vacuum pump when proper evacuation has been secured. A check valve in the vacuum line is excellent assurance against air being drawn back into the system when the pump stops.

The scale may be provided with a stud or rod fixed to the lever arm so that shot or a number of lead weights can be added to counterbalance the weight of the cylinder, sleeve and clamp arrangement. If the scale has a long beam and plenty of counterweights, this is not required. Most scales, however, and especially those readable in ounces, require some extra counterbalancing.

To weigh in a certain charge carefully set the rider weights until the beam indicates proper balance. Then set back the riders for whatever weight of refrigerant the unit or cylinder is to receive. Open the charging valve and watch the beam. As soon as it comes to balance the correct or desired quantity has been run into the unit or cylinder and the charging valve must be closed immediately.

It is best that the cylinder or unit be placed on the floor for charging. When the charging valve is closed tap or shake the charging line to permit the liquid refrigerant in the line to flow down and into the unit or cylinder. Then close the valve on the charged cylinder or unit, or pinch the line with a pinch-off tool if the unit is of the valveless type.

Next open the vacuum valve and run vacuum pump to clear the refrigerant vapor remaining in the flexible charging line. The unit or cylinder can then be disconnected and another gotten ready for evacuation and charging.

Pressure Testing

Where units have been pulled down for complete overhauling it is an excellent plan to evacuate thoroughly and then allow an ounce or two of refrigerant to enter the system and build up a gas pressure. Such units can be tested immediately for leaks or can be laid aside with others similarly treated. If pressure is lost it is an indication of a leak. Bear in mind, however, that a certain amount of gas will be taken up by the oil in the system. F-12, methyl chloride, Isobutane and sulphur dioxide will be absorbed by the oil in the order listed; F-12 to a great extent and sulphur dioxide the least.

It is evident that any unit which cannot be pulled down to a deep vacuum has a defective flare, split tube, broken gasket, defective

seal or some opening or loose section which is admitting air. In such a case give the job a "shot" or refrigerant and locate the leak or leaks. Several small leaks will admit as much air as a single large one.

With leaks repaired, evacuate gas and air in the repaired system before charging, using the vacuum gauge as an indication of the tightness of the system.

Apparatus for Large Shops

Larger shops, where charging is going on continuously or almost so, require apparatus which makes use of the larger sizes of refrigerant cylinder. The apparatus shown in Fig. 1 may be used for the purpose, save that an overhead block and fall or chain hoist is used to lift cylinders into place on the scale.

Figure 2 depicts a somewhat similar idea, with changes in hook-up which makes it useful in the larger shops.

A small refrigerant cylinder is permanently fixed to the platform of the scale by use of a clamp and iron tripod. If desired, the sleeve arrangement shown in Fig. 1 can be used to assure a somewhat more permanent and stronger job.

Before setting the cylinder in place on the platform the service valve must be unscrewed and a special tee arrangement inserted in its place. The best tee for the purpose is a drop forged steel one, such as used for ammonia work. A street elbow, also of drop forged steel, is threaded internally on the male end to take a tube which extends to within an inch of the top of the drum when screwed into place.

Use litharge and glycerine in making up the pipe threads and employ considerable force in making up joints. Feel the fittings immediately after screwing up. They should be warm, indicating proper make-up. Do not attempt to move the fittings once they are pulled up for to do so will crumble the thread compound.

The use of a small cylinder on the platform makes a very sensitive job, one capable of weighing in refrigerant to the ounce if the scale is of that type.

A permanent weight is used to counterbalance the drum and lines and is made up when the flexible lines have been set into place.

A chain hoist or a block and fall arrangement is used to raise the large refrigerant cylinder up to or close to the ceiling. By raising this cylinder, gravity is usually sufficient to cause refrigerant to run into the weighing cylinder. Again, it is well known that the temperature is higher nearer the ceiling than at the working level. This higher temperature will result in higher pressure, of course, and will aid in forcing refrigerant into the weighing cylinder. Heating of the main cylinder is obviated by this arrangement and much time is saved thereby.

Four timbers, preferably of 4 inch x 4 inch stock, may be used as guides for the large cylinder. The upper section of each timber should have a strip of 2 inch x 2 inch stock nailed to it so that when the cylinder is raised by means of the strap and hoist it slides up into and is locked in place by the strips and cannot shift out of the timber cradle.

Using the Larger Apparatus

As may be noted by reference to Fig. 2, there are 4 valves in this hook-up. Valves 1 and 3 are tee valves, that is, only the side opening is capable of being opened or closed by the manipulation of the valve stem.

Valves 2 and 4 are plain shut-off valves. The line in which valve 4 is located is the one that connects with the riser tube in the weighing cylinder and connects to the vent line. A check valve should be placed in the line, as shown.

In use the main drum valve is left open. Weighing cylinder is usually emptied with each charging operation and to fill it with the amount required for charging a unit or cylinder merely involves opening tee valve No. 1. To fill the vessel rapidly, valve No. 4 should be cracked open. This will permit some gas to escape to the vent line. By having the rider on the beam set for the required charge the operator closes valve 1 when the beam balances. Of course, valve 4 is closed either prior to closing valve 1 or immediately after doing so.

The unit or cylinder to be charged is merely hooked up to the outlet of tee valve 3, generally by means of a flexible line. Valve 2 remains closed but valve 3 is opened and the vacuum apparatus started so as to pull

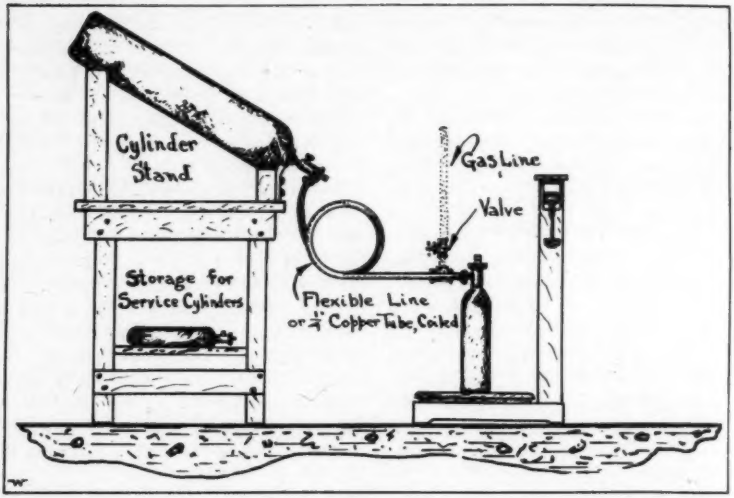


FIG. 3. SIMPLE HOOK-UP FOR FILLING SERVICE CYLINDERS USED IN AVERAGE SMALL SHOP

a deep vacuum on the drum or apparatus to be charged. Evacuation may be allowed to proceed while the operator is felling the weighing cylinder with the quantity desired.

When evacuated, valve 3 is closed. All that is necessary to transfer the charge from the weighing cylinder to the unit is to open valve 2. This permits the charge to leave the weighing cylinder and enter the unit. The rider on the beam will indicate when the weighing cylinder is empty. Then valve 2 is closed. Apparatus is then ready for the next charging operation.

By use of this equipment a cylinder or unit can be charged in a matter of just several minutes.

To be concluded in the October issue. A description of other charging equipment will be illustrated and described.

The Frigidaire Sealed Unit Relay

Service Engineers Should Know How to Diagnose Trouble in Electrical Circuits on Hermetic Jobs. This Article Shows How to Do It.

By WALTER G. CHRISTIE, B.S.E.E.

EACH year more and more refrigerator manufacturers are going over to the hermetically sealed unit. This year, the Frigidaire Corporation has abandoned the "open" unit for the hermetically sealed unit.

The electrical circuit is the only part of these refrigerators that can be serviced in the field. Eventually, if the present trend toward hermetically sealed units continues, the service man will have to be able to diagnose the electrical circuit as quickly and as accurately as he now diagnoses the refrigerant circuit. Hence, it will not be amiss to describe the operation of the Frigidaire electrical circuit at this time. At a later date, the operation of more complicated circuits of other manufacturers will be described.

Before attempting to describe the operation of the relay circuit, a study of the motor used on most sealed units might be helpful.

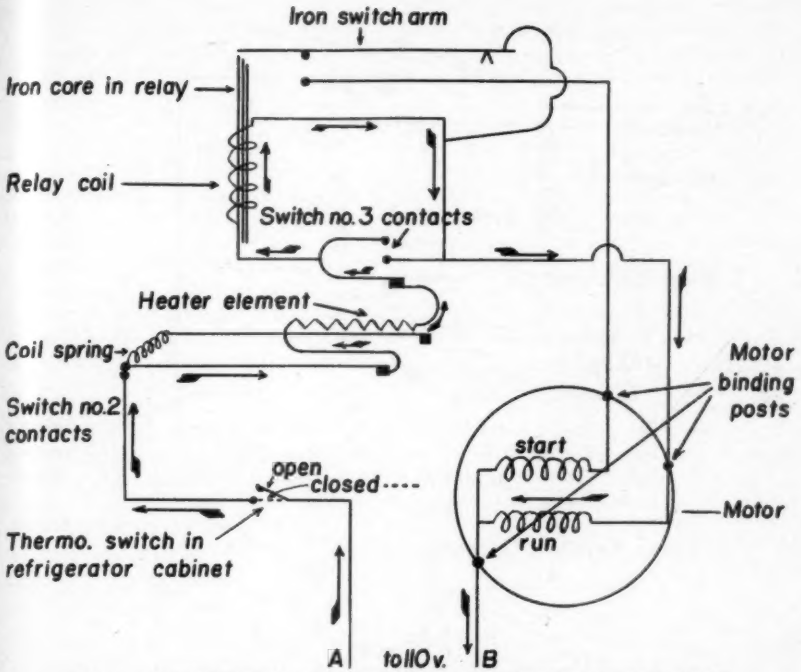


FIG. 1. ARRANGEMENT OF PARTS WITH THERMOSTAT SWITCH OPEN
At instant thermostat switch is closed, current flows from the line in the path shown by the arrows. Current flows from line at *A* through the relay and through the motor back to the line at *B*.

The Frigidaire sealed unit uses a split phase motor. The motor has a laminated iron armature sometimes called a "squirrel cage" armature and two separate field windings. One winding is made up of heavy, low resistance wire; this is called the *running winding.* The other winding is made up of fine, high resistance wire; this is called the *starting winding.* When both windings are connected to the 110 volt supply, current flows in each winding. *When current flows in both windings simultaneously, a magnetic field revolves inside the motor frame.* This magnetic field is caused by the current flowing in the field windings. *It revolves because of the difference in resistance of the two windings.*

If only one field winding is connected to the 110 volt line, current will flow in this one field. A magnetic field will be set up inside the motor frame, *but it will not revolve.*

The revolving magnetic field drags the iron armature (squirrel cage) around as the field revolves just as a horseshoe magnet will drag a piece of iron which is held near it. *Thus the revolving field starts the motor.*

Once the armature is revolving at 1800 r.p.m., the magnetic field from one winding will keep the armature revolving. Hence, when the motor speed is up to 1800 r.p.m., the starting winding is no longer required and it can be disconnected.

New Type Relay

The relay described in this article is the *new* type relay which is used on all the 1936 Frigidaires and which is used as a replacement on the 1933, 1934, and 1935 standard line Frigidaires.

The relay has 3 primary functions:

1. To connect both starting and running windings to the 110 volt line to start the motor.

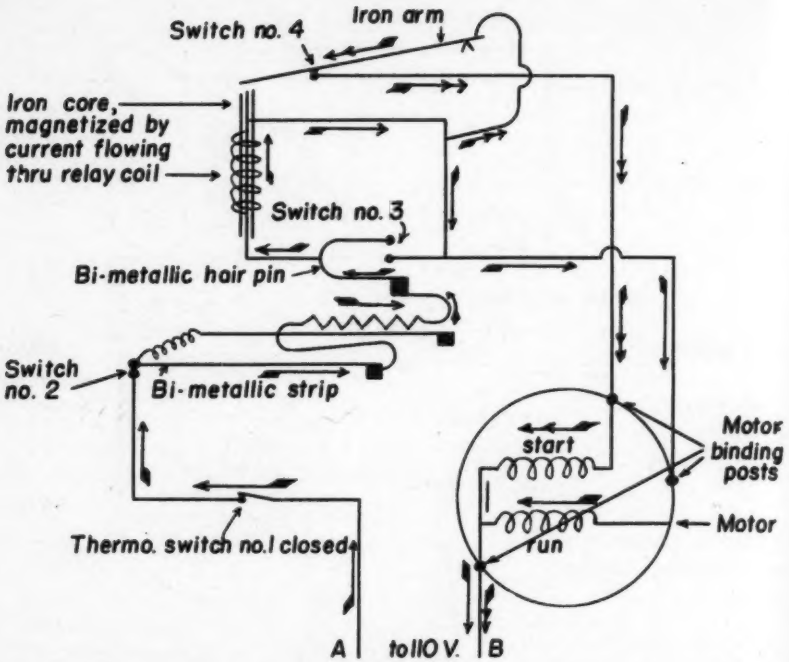


FIG. 2. ARRANGEMENT OF PARTS A MOMENT AFTER SWITCH NUMBER 1 IS CLOSED
Current flowing through the relay coil magnetizes the iron core of the coil and attracts the iron arm of SW♯4 closing contacts of SW♯4. Current then flows through SW♯4 back to the line at *B* as shown by double arrows.

2. To disconnect the starting winding from the 110 volt line after the motor speed has reached 1800 r.p.m.
3. To disconnect both starting and running windings from the 110 volt line in case of an overload on the motor and thus to keep the motor from burning out.

Figure 1 shows the working parts of the relay when the motor is stopped (thermostat switch on inside of cabinet has stopped machine). When the thermostat switch is closed (as shown by dotted lines in Fig. 1), current flows from the line at *A*, through the thermo switch, through the overload switch, through the switch arm, through the heater element, through the hairpin bimetallic resistor, through the relay coil, back through the running winding to the line at *B*. This flow of current should be carefully followed on Fig. 1, the arrows on the figure representing the path of the current. From this analysis, the reader should see how the relay delivers current to the starting winding.

This current will cause a magnetic field to exist inside the motor frame, *but the motor will not start because the field is not revolving.* In order to make a revolving field exist inside the motor frame, current must flow through the starting winding of the motor.

When the running winding current passes through the relay coil, it magnetizes the iron core of the relay coil. The relay core then attracts the iron switch arm of switch number 4, closing it as shown in Fig. 2. When switch number 4 is closed, current from the relay coil *flows* not only back through the running winding as before, but also through the switch arm of switch number 4 *back through the starting winding of the motor to the line through line B as shown by the*

double arrows in Fig. 2.

The motor is now able to start because current is flowing in both running and starting windings. As explained before, when current flows in both windings simultaneously, a revolving field is set up inside the motor frame which drags the iron armature around thus making the motor start.

Switch number 2 and switch number 3 in Fig. 2 both make use of pieces of bimetal for their operation.

A bimetallic strip is made up of two dissimilar metals bonded together to form one metal. For example, a piece of copper might be riveted to a piece of iron to form a bimetallic strip. Now all metals expand when heated but all metals do not expand at the same rate. Thus, if iron expands more than copper, when the bimetallic strip is heated, the iron side of the strip will become longer than the copper side. As a result, the strip will bend or curl. As soon as the heat is removed, the iron and copper will contract to their original length, and the strip will straighten out and assume its original shape. This principle is used in switches numbers 2 and 3.

Switch number 3 is made of bimetallic strip bent in the shape of a hairpin. When the motor current flows through the lower part of this bimetallic strip, it heats the strip and as a result, the strip starts to bend. In about 2 seconds, the strip has bent sufficiently to close switch number 3 contacts.

When switch number 3 closes, the relay coil is short-circuited, and no more current can flow through the coil. All the current must flow through switch 3 (see Fig. 3). As soon as current stops flowing in the relay coil, *the coil becomes demagnetized and switch number 4 opens.* As a result, *the starting winding is disconnected* (see Fig. 4) and the motor runs on the running winding alone. As long as the motor runs, cur-

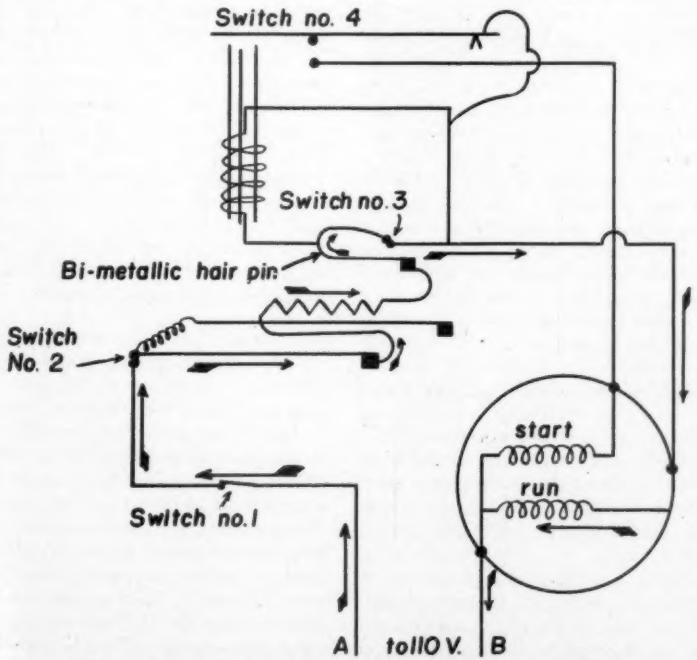


FIG. 3. THREE SECONDS AFTER THERMO SWITCH IS CLOSED
Current flowing through lower part of bimetallic hairpin (SW♯3) causes hairpin to bend and close SW♯3, short-circuiting the relay coil and opening SW♯4. The hairpin closes SW♯4 about three seconds after thermo. SW starts motor.

rent flows through the bimetallic switch number 3 thus keeping the switch closed and the starting winding disconnected.

When the refrigerator temperature has dropped sufficiently, the thermostatic switch number 1 opens and the motor stops. The bimetal in switch number 3 cools down and the bimetal bends into its original shape so as to open switch 3 and the unit is again ready to start as shown in Fig. 1.

The Frigidaire sealed unit employs a rotary compressor without either a high side unloader valve (as used in GE and Westinghouse) or a low side check valve as used in Norge. As a result, the Frigidaire unit cannot start until the high side and low side pressures equalize. Hence, if the supply power should fail for a moment while the unit is running, the unit could not start until the two pressures balanced. This may take fifteen minutes. Hence, to keep from burning out the motor switch number 2 is used. When the motor fails to start, the current flowing through the motor windings is very large. This large current makes the heater element in switch 2 red hot. The element heats the air around the bimetallic strip of switch number 2. The bimetallic strip bends up and the coil spring which is attached between the bimetallic strip and the switch arm, pulls the switch arm up thus opening switch 2 and stops the flow of current to the motor. In approximately two minutes the bimetal cools and bends back into its original shape and switch number 2 closes. This cycle will continue until the motor is able to start.

Trouble Shooting on the Frigidaire Sealed Unit

Every service man who works on Frigidaire sealed units should have a test cord. This test cord can be made up in a short time by using the diagram shown in Fig. 4. The test cord is used to prove that the relay is defective.

If the unit won't start and the box is warm, the trouble may lie in the thermostat switch, the unit, or the relay. An examination of the thermostat will show whether or not the switch contacts are closed. If they are closed, the trouble must be in the relay or in the unit (it is, of course, assumed that the service man has tested the power supply to see that the machine is getting power).

Remove all food from the box and lay the box on its back so that you can get at the relay which is mounted near the motor. Remove the three motor leads at the motor and in their place, install the test cord. Plug in the test cord and press the button on the test cord. If the motor starts, release the button after about 2 seconds. If the motor continues to run, the trouble is in the relay.

Reconnect the motor leads and plug in the motor lead. If there is no hum in the motor, the heater element in switch number 2 is burned out and the relay must be replaced. *Do not substitute a piece of wire for the heater.* If this is done, *the motor will burn out the first time the motor fails to start.*

If the unit hums but does not start, the trouble lies in either switch number 3 or 4. Switch 3 may have frozen contacts so that the switch cannot open. Cleaning the contacts will generally clear up the trouble.

If the trouble lies in switch 4, either the contacts are dirty so that the switch does not connect the starting winding or the switch arm is bent so the contacts do not close.

If the motor starts but the overload switch number 2 keeps stopping the job, switch 4 is no doubt burned closed so that the motor keeps running on both the starting and running windings. When this happens, the points can generally be cleaned up.

Replacing Switch

Experience has proven that when a new switch is available, it is far cheaper and more satisfactory to both customer and service man to change the relay rather than attempt to repair the old one. An attempt at repairing the old one should be made only when a replacement relay is not available.

When replacing a relay, it is essential that the proper size relay be used. (All size relays are identical except for the resistance of the heater in overload switch 2.) The horsepower of the unit can be obtained from the serial name plate which is located on the top of the condenser. This will be given as .05 hp., .06 hp., .08 hp., or .14 hp. The relays are marked correspondingly.

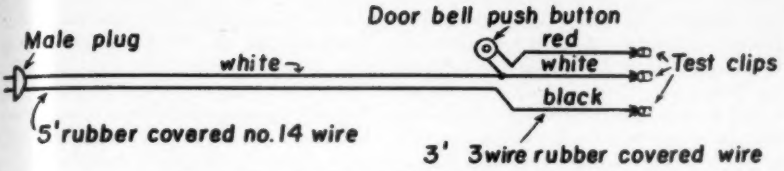


FIG. 4. TEST CORD FOR FRIGIDAIRE SEALED UNIT

If a .06 relay is put on a .05 unit, the unit will work all right until the power fails during a running cycle or until sometime when the unit tries to start before the internal pressures are balanced. In this case, the overload switch will not kick out when the motor fails to start. The current passing through switch number 3 will keep switch 3 closed so that the starting winding will not receive any current because when switch 3 is closed the relay coil is short-circuited and switch 4 must be open. Hence, unless the customer pulls the plug and allows the unit to cool, the machine will not start and in several hours the running winding will burn out.

Shop Service and Rebuilding General Electric Hermetic Units

THIRD ARTICLE

In This Article the Author Suggests the Method of Refinishing Unit, Its Assembly, Testing, Dehydrating and Other Service Pointers

By EDW. D. GEISER

ONE of the greatest difficulties in servicing the G. E. Hermetic is the fact that to be competitive with the company product, a very good finish is required, and the service man should keep this point in view.

Refinishing

In order that such a finish can be applied, all paint must be removed, and due to the design of the unit, it is somewhat difficult by ordinary methods. Many methods were tried, and although sand-blasting removes the paint, it is expensive and leaves the copper in a rough condition. It was found that the only way to remove it was by complete immersion. It must be remembered that in jobs in which motors have burned out, there is a chemical breakdown which leaves a hard granular substance coupled with a carbon deposit on the walls, which is very hard to remove and which requires that the dome and the compressor be washed inside and out. A solution is available which will give the desired results both in the removal of paint and this deposit.

Before washing in any type of solution, shop should make sure that all lines and openings are sealed to prevent moisture from entering unit. After washing unit and drying exterior, the unit is now ready for final assembly.

Assembly

On the D. R. 1 type with welded unit base, base is forced over compressor base and brazed or arc welded in place. *Caution:* Do not braze near terminal plugs. Remove oil plug and seal with soft solder. Solder motor leads in place, locating leads as shown

Copyrighted. Reproduction of all or any part prohibited.

in switch sketch published in the July issue, and install heater coil. Then bend suction line to shape, replace insulation, install evaporator and top plate, replace screws holding plate in top, swedge and silver solder liquid and suction lines, clean 6 inches of condenser line into float, leaving on condenser line approximately one-half inch of tubing to use as sleeve.

On bolted base types, assemble base and bolt in place, add insulation and proceed as in above unit with exception of D. R. 2 brine tank type. In this type, join the suction line from compressor base just long enough so that when it is swedged, the suction lead from evaporator will socket into place.

Dehydrating

To dehydrate, place service valve on float and open to full purge position, and dehydrate 24 hours at a temperature between 200 and 240° F. Attach leads to running and common leads and subject motor winding to temperature. When machine is removed from oven, allow to cool to room temperature. If machine has a brine tank evaporator, replace brine, attach switch and accessories, if any, and test motor for running. Attach high-side gauge in line and charge with required amount of gas while running. Charging should be done with valve in full open position, allowing gas to feed directly into evaporator. After charging, units should be installed on test box and a time and temperature recorder should be used during test run, testing all points of temperature range on switch, i.e., 0 to 10 degrees low, 10 to 20 medium, 20 to 30 high or warmest point.

After machine has proven satisfactory on test run, wash and clean evaporator, paint liquid suction line, and spray finish unit.

"Short Cut" Pointers

As in every type of work, there are short ways to do it, and the writer will endeavor to give many points that will aid in the repair of these units.

Often when motor fields are rewound, there is a slight difference in the resistance from the original, and this will cause the starting relay of the switch to either not raise, or to raise and not drop. The latter indicates too great a resistance in motor and vice versa. To remedy, remove one or two turns from magnet coil when coil will not drop, and add one or two turns when magnet or coil raises. One of the most economical tests, and which will recheck several items of importance on the compressor when running on test, is to use a switch which will indicate if rotor is shorted, or if motor winding is defective.

Replacing Bearings

It is found necessary sometimes to replace bearings, as shown in Fig. 7, illustrated in the July issue. These bearings are subject to wear, and if loosely fitted, permits compressor block to break its suction under high head pressure. This will be noticed particularly by the fluttering of the low-side gauge when running on test. Bearings can best be replaced as follows: machine exact reproduction of old bearings, making sure that oil hole and groove are in shaft around piston and through piston seal, and into high-side unloader check compartment. Press old bearing from plate, and press new bearing into place, bolt plate into place, using taper pins for location, and line ream using upper bearing as guide for reamer. Extreme care should be exercised in replacing a bearing, as it is extremely difficult to match the port surfaces of block and plate if block is not at perfect right angles to plane off the plate. Occasionally, it is necessary to replace upper bearing, but always replace lower bearing first and then use lower as guide for upper in case you do replace this bearing.

The eccentric shaft bearings of the single-cylinder models seldom have to be replaced, as these are hardened steel bearings, running in a full film of oil, but if necessary, these bearings may be pressed out and new ones installed and ground on a centerless grinder, by using taper pin holes and plate base as location points. In the two-cylinder models, the bearing that connects the two pistons together is often found broken. This is due to locking pin in piston breaking or dropping out, permitting bearing to drop to base and be broken. This is a hardened steel bearing and should be ground to size. Quite frequently on these models, the eccentric shaft bearings wear to such an extent that considerable noise is produced from the rotor striking the field. Replacement is the only satis-

factory way to remedy this condition. Due to the cost of these bearings, it has been found more satisfactory to use bronze bearings. By shortening the upper bearing 5/10ths of an inch and pressing in a steel collar to make up for the shortened bearing, grind the top surface of this collar to provide a bearing surface for the thrust washer directly underneath the rotor.

On early models of D.R.2's, there is a small bronze thrust washer bolted onto lower shaft of compressor block, holding the block tightly in place. If this is left off from assembly, close up oil passage way to this thrust plate.

Shorted Rotor

Shorted rotor: This condition is caused by solder leaving rotor due to heat from motor burning out. The only satisfactory way to test is by running as explained in previous articles. If rotor remains cool, it is satisfactory; if not, it must be resoldered, and this is best done by building up a heavy ring solder with a torch and removing excess on the lathe. This method will maintain balance of rotor. Rolling in solder bath is not satisfactory. Do not depend upon growler method to test rotor as this test does not always show when they are defective.

Due to injury, it is often advisable to rewind condenser with new tubing. This may best be accomplished, removing old tubing and crimp back small lugs expanded into tubing with chisel on mounting brackets. Place dome in lathe while holding tubing firmly, and turn lathe and tap into place with soft wooden block. Then, with chisel expand lugs to lock tubing in place.

When a flapper valve disc breaks, it will score the cylinder walls. A sleeve may be inserted in the upper half and ground and lapped to size, thus salvaging the block.

In brine tank jobs, a small plug is found at the back of the tank. Use a special set screw wrench to remove, and then remove brine whenever job is to be dehydrated, as plug contains fusible metal which will melt and release brine.

When washing jobs that are to be welded, always wash metal parts of a compressor with carbon tetrachloride, as well as area around bead to be welded as it is difficult to get a good job on surfaces which may have oil on them. *Do not use gasoline or any inflammable substance as gas generated during welding is liable to cause explosion.*

This series of articles will be concluded in the October issue. Further service pointers as well as pertinent data on this machine will be published.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box." The following questions are answered by Mr. George H. Clark.

REPAIRING COMPRESSORS

QUESTION 144. *Last February I completed a course in refrigeration servicing and have done some servicing work on my own for the past five months.*

Today, however, I received an answer to an application placed with the Crosley Refrigerator Co. The company wants a man to work in the shop repairing compressors, and while I know what the inside of a compressor looks like, having had them apart, nevertheless I would appreciate any suggestions or information you could offer as to the duties as well as the problems of compressor overhauls. By this I mean the troubles found as a rule, and how to identify them according to the usual shop procedure.

ANSWER: The principal thing to keep in mind in overhauling compressors is to see that the compressor seal is in good condition, that the suction and discharge valves in the compressor are operating properly and that there are no mechanical knocks.

Mechanical knocks are purely a problem in mechanics and require that all bearings be tight and that the compressor be properly charged with oil.

With respect to testing for seal leaks. One of the simplest methods consists in closing off the inlet side of the compressor and pumping from the discharge side into a bottle of oil through a small tube. If the compressor seal leaks and the seal is in the low pressure part of the compressor, which is true in almost all machines, the bubbles will continue to come through the oil, indicating that air is leaking into the compressor and is being discharged into the oil. If no bubbles come through, it indicates that there are no leaks in the low pressure side of the compressor.

In some cases it is well to test the compressor crankcase with a pressure of approximately 50 pounds per sq. in. gage for compressors which are to be used with sulphur dioxide and up to 75 pounds per sq. in. gage for compressors which are to be used with methyl chloride. Some types of seals will open at high crankcase pressures and that is the reason, of course, for the pressure test on the seal. After the seal actually opens at these pressures, the air or gas can generally be heard blowing out the seal or will make its presence known by pushing oil out the seal.

Where the compressor uses a piston valve, this may be checked by running the compressor on a bench without the head on the compressor. The service man can put his hand over the compressor cylinder to act as a head valve. The compressor should push air out between the cylinder and the service man's hand and there should not be too great a suction on the hand when the piston is going down provided that the inlet to the compressor is wide open. If the compressor has a high suction on the hand, it indicates that the piston valve is not opening as easily as it should. If the compressor pumps all right by this test, we can be quite sure that the piston valve is in good condition.

The head valve may be checked by using a rubber cup such as is used to hang coat hangers on a smooth glass surface or any other small suction cup. The rubber cup can be pushed over the valve inlet with the rim of the cup on the smooth surface of the valve plate. The rubber cup should push the air through the valve but the valve should check so that the air cannot get back through the valve and, consequently, the rubber cup should stick to the valve plate. In some cases, if the valve is pretty near perfect, the cup will stick to the plate for quite some time. If the valve has a very moderate leak, the cup may only stick to the valve plate for a matter of a few seconds. If the cup does not hold to the valve plate at all, it is an indication that the discharge valve is very bad.

The head valve should also be checked to see that it opens with a light pressure on the valve itself. This opening with this light pressure may be only very slight, possibly not more than .010 of an inch, but it should have a small opening with a very little pressure on the valve disc. If the valve opens too hard, the compressor will make a noise which in a good many cases sounds very similar to a mechanical knock.

The clearance between the compressor cylinder and the head should, of course, be kept as small as possible, but there should be no possibilities of head knocks, which is the term applied to the knock caused by the piston hitting the head valve plate in the compressor.

RECLAIMING SO_2

QUESTION 145. *We would like some information regarding reclaiming outfit for sulphur dioxide.*

At the present time we are discharging from thirty to fifty pounds a day and would like to know if, in your opinion, such equipment is practical. If such is the case, what equipment would you recommend?

ANSWER: Where you are discharging from 20 to 50 pounds of sulphur dioxide per day, it would seem as though some sort of reclaiming equipment might be a paying investment. Such equipment, in my opinion, should consist of a compressor and cylinders so that the sulphur dioxide may be evaporated in one cylinder and passed through a calcium chloride dryer as a vapor and then condensed and stored in another cylinder. If there is any possibility of there being any appreciable amount of moisture in the sul-

phur dioxide, it would probably be advisable to distill the sulphur dioxide several times passing through large calcium chloride dryers in each distillation and it would probably be advisable also to leave or discharge a small percentage of the sulphur dioxide and impurities in the cylinder which is being used for evaporating the refrigerant in each case.

Further advice on such equipment might be obtained by studying the refining methods of the various sulphur dioxide manufacturers.

FRIGIDAIRE EXPANSION VALVE

QUESTION 146. *Any information you can give me on the servicing of a "Frigidaire model T, 5" will be greatly appreciated. Do you have to have a special tool to adjust the expansion valve? If so, where can I get one from? What are the best settings on the L. P. gauge for the expansion valve?*

ANSWER: My experience with the Frigidaire model "T, 5" expansion valves indicates that these valves are very reliable in their operation and very seldom need adjustment.

Where these valves do not control the flow of refrigerant at the proper pressure, I have found that it may be due to the fact that the valve needle and seat are badly pitted so that the valve does not close off properly, in which case the whole valve should be replaced, or, in another case where the suction pressure has been found to be too low, it is generally found there has been some partial plug-up in the valve screen or valve itself and that a thorough cleaning is all that is necessary.

Where the valve has to be adjusted, it may be necessary to obtain a small spanner wrench which can be made up at some machine shop. Ordinarily the suction pressure on these machines runs between five inches and eight inches vacuum.

NIZER INFORMATION

QUESTION 147. *Nizer Condensing Unit as follows:*

Refrigerant: SO_2.

Motor: Remy Series Motor, 110 volts AC and DC, ¼ hp., vertically mounted, Model 1210G, Serial No. 23714.

Compressor: Single cylinder, reciprocating piston type with crank. Discharges through flapper type valve into copper dome having water coil of continuous copper tubing. Compressor driven via worm gear principle from end of motor shaft; no belt. No name plate of identification marks on compressor.

Pressure Control: Nizer, of same type exactly as explained in July, 1935, REFRIGERATION SERVICE ENGINEER.

Misc.: Two pieces rubber hose connected to condenser unit and running through holes in floor.

Job hooked up to ice cream work.

Information Wanted:

1. *Approximate year of condensing unit, if possible.*
2. *Model No. of compressor (or condensing unit as a whole).*
3. *Oil charge and brand recommended for this job.*
4. *Refrigerant charge (SO_2).*
5. *When painting dome, should black lacquer or common black paint be used? This will be over copper surface.*
6. *Bearing on worm end of main shaft held fast by 4 claws. What tool can be used to remove ball bearing without damage?*
7. *Any other service information that is available.*

ANSWER: 1. In all probability this machine was built somewhere in the 1920's. I am not familiar enough with the history of the company to know just exactly when this model of machine was discontinued.

2. I do not know what the model number of the compressor or unit would be. I would simply specify it as a "Nizer single cylinder compressor."

3. The oil used in this machine is the same kind of oil used with any sulphur dioxide machine, and I believe two or three pints of oil in the crankcase should be sufficient, but it is quite possible that some of the oil may be carried over into the evaporator if the evaporator does not already have its proper charge of oil.

4. The refrigerant charge depends entirely upon the evaporator it is to be used with. In connection with the flooded type evaporator, it may be found that some 12 to 20 pounds of sulphur dioxide may be required.

5. Generally the dome is left unpainted, but this has no particular bearing on the

operation of the machine. Lacquer is usually more desirable for painting machines of this kind due to the fact that it dries almost instantly.

6. Special bearing pullers are required for this machine and may be procured through the Kelvinator Company.

7. The seal on this particular machine consists of a stuffing box and this should be checked to be sure that it is in good condition. Quite generally when the stuffing box starts to leak the machines are replaced with newer models. These machines have given a lot of very good service in their time, but they are difficult to work on and the labor charge for an overhaul on one of these machines is apt to be quite high.

ADDING GAS TO 1927 G. E.

QUESTION 148. *Would like to know if gas can be added to a 1927 model G. E. (this is what the customer says it is.) It has the dome top with the cooling coil around the compressor. How it should be done.*

The only opening I can find is in the lower end of the cooling coil.

I also have a "Freezit," made by Illinois Moulding Co., which I have been working on and each time I pump the SO_2 out of the evaporator, then start it up, it will work fine. Then after stopping the unit for a while, it will not frost any more.

I have had the compressor apart and replaced the valves; also had the evaporator apart and it seems to be okay. This has a bucket type float. I also put in a new needle valve. The suction pulls down to about 5 to 10 lbs. pressure and stays there. Head pressure is normal. It has been serviced before.

ANSWER: I believe refrigerant can be added to the model of General Electric machine which you describe. However, I believe it will be necessary to use a pinch-off tool as a valve on the small tube which is connected into the cooling coil.

Later models have a service connection so they can be serviced by means of an auxiliary valve.

With respect to your trouble on the Freezit refrigerator, it seems to me that your trouble is either due to a small leak in your float or to a slightly leaky needle valve. In either case the bucket type float would fill with refrigerant during the off-period and then, of course, the valve would remain wide open until the evaporator is pumped down again and the refrigerant evaporated out of the bucket.

NORGE

QUESTION 149. *About one month ago, I repa'red a 1932 Norge refrigerator, replacing the check valve in the suction service shut-off valve, put in a new needle valve (for low side float system), took oil out of Rollator and filled with new Norge Rollator Oil and put in 20 oz. (the amount they call for in their specifications) and charged system with new supply of SO_2.*

Before replacing, I tested the compressor for efficiency and could pull 25 inches of vacuum and hold a pressure fairly well.

After two or three weeks of operation, I was called back to the job and was told the machine runs continuously for 2 or 3 hours, then runs for a day or two at a fairly normal on and off cycle such as 15 minutes on and 25 to 30 minutes off. The machine will then start to run continuously for 2 or 3 hours, and the customer will phone again and I may not be able to go to see the machine for a few hours; then, when I get there again, she said it had just started to run okay again.

This condition has me stumped and I would appreciate it very much if you could suggest any causes or cause that makes this machine run as I have tried to describe to you above.

When machine runs, the evaporator temperature is below 14°, as I have a Ranco thermostat No. 453 in the system, and the cut-in temperature is 26° F. and cut-out temperature is 14° F., but very little frost is on evaporator after it has operated for 3 or 4 days, but still temperature is low enough to stop box.

ANSWER: The various reasons for the Norge Refrigerator acting as you describe it might be as follows: first, a control which is not entirely reliable in the cut-in and cut-out points; second, the compressor may temporarily fail to pump as well as it does normally; third, the float valve may be faulty and in some cases stick open a little bit more than it should and cause the machine to run

for an extra long time during the on-cycle; last, the refrigerant charge may be just about on the border line between being the right charge and just a little low.

CROSLEY BEER COOLER

QUESTION 150. *I am experiencing trouble with a Crosley beer cooler, which apparently lost its charge and sucked in air on the low side and built up a head pressure of about 160 lbs. I purged this job several times and recharged it, but am apparently unable to get all the air out, as Crosley service valves are not of the conventional type. This machine does not maintain a steady suction pressure. The first section of the evaporator freezes ice around itself and the bottles, but the last section is not cold enough, although the machine cycles.*

There have been no parts changed other than the leak stopped. What suction pressure is recommended? Any other information you can give me on this job will be greatly appreciated.

ANSWER: In purging a system which makes use of a capillary tube as a pressure reducing device it is usually advisable to purge at the suction line rather than at the discharge line.

When the refrigerating system does not contain any liquid receiver but goes directly through a screen and capillary tube to the evaporator, any air which might get into the system passes directly through with the refrigerant into the evaporator and is continually circulating throughout the system. If the machine is stopped so that the pressure in the evaporator is above atmospheric pressure, the suction line can be opened and the air contained in the evaporator will be purged out with some of the refrigerant.

With a system of this kind where only the first section of the evaporator freezes, it is an indication that the system is low on refrigerant. Just enough refrigerant should be added to bring the rest of the evaporator into operation and caution should be taken to insure that the refrigerant does not reach back into the suction line and into the compressor.

The suction pressure, of course, depends on the evaporating temperature in the evaporator and is variable, depending upon evaporator temperatures.

For a machine freezing ice around the coil, I believe that the suction pressure should normally not get below atmospheric pressure and to insure that the ice does not entirely melt off the coils the pressure should not get above eight pounds gage pressure.

WILLIAMS ICE-O-MATIC

QUESTION 151. *I would like information concerning a Williams Capital Ice-O-Matic. What is the correct charge of gas for the above, with the only lettering on the cooling unit I can find is type ko3, serial number 10976? Also, what are the correct head and back pressures for same?*

Would there be anything unusual to overcome in converting same to a dry system?

Could you tell me what the operating pressures are on a Frigidaire single cylinder 1/6-hp., put out six or seven years ago (an SO_2 job)?

ANSWER: I do not know what the charge of gas is that the Williams Company recommends, but for the float type evaporator which they use a total charge of three pounds of methyl chloride should be sufficient. The head pressure may vary from 70 to 120 pounds, depending on the air temperatures, while the suction pressure may vary from 4 to 20 pounds, depending on the setting of the temperature control. The suction pressure, of course, is variable while the machine is in operation. It is advisable to check this particular type of machine to insure that the blower type fan used is operating properly. This blower type fan draws air in over the lower part of the condenser and blows it out over the upper part of the condenser. The operation of this blower may be checked by blowing smoke into the condenser and following its path.

There should be no unusual difficulty to overcome in converting the Williams machine into a dry type. When using a dry-type evaporator, of course, from one to one and one-half pounds of methyl chloride should be a sufficient charge.

The operating pressures on the Frigidaire machine using sulphur dioxide would, of course, be the same on any sulphur dioxide machine made at any time, depending on the

type of pressure reducing valve used in the system. If the evaporator is a float-valve type, the operating pressure should be approximately six inches vacuum on the cut-out and four pounds gage on the cut-in. If the system uses an automatic expansion valve, the suction pressure should be approximately six inches vacuum. The condensing pressure, provided the condenser is clean and the air circulation is all right around the condenser, should be somewhere between 50 and 100 pounds gage, depending on air temperatures and also on the suction pressure obtaining in the compressor at that particular time. The higher the suction pressure the higher the head pressure would be at the same time.

The Tool Kit

A Complete Tool Kit Is the First Need for Good Service Work

A Good Mechanic + Good Tools = a Better Job in Less Time. It Is False Economy to Use Make-Shift Tools.

By SAM ROBINSON*

"CLOTHES make the man" is a statement we have all heard at some time, but one that we, nevertheless, do not agree with. If it were true it might also be said that "Tools make the mechanic." It goes without saying that this is not true.

However, it is true that if two mechanics of equal knowledge and ability are given the same job to do, the one having the better tools, tools designed especially to do that job, will be able to do a more satisfactory piece of work in less time than the mechanic who depends on make-shift tools.

A handy pocket size kit of sockets and ratchet

Nowhere is this condition truer than in the servicing of electric refrigeration equipment. It has been only in the past few years that tool manufacturers have given much thought or consideration to the tool requirements of the refrigeration service engineer. This, no doubt, has been due to a great extent to the claims and guarantees of performance and to publishing records of trouble-free operation of some of the leading manufacturers of electric refrigerators.

Repeated requests for tools to do particular types of jobs have had the effect of impressing the tool manufacturer that there is a real need for specialized tools in this field. Several of the leading tool manufacturers, as a result of this demand, have made a thorough study of the tools that will best care for the work that must occasionally be done on the millions of electric refrigeration units already in domestic use and the hundreds of thousands of commercial units. Electric refrigeration manufacturers have developed their units to a point where they are practically "fool-proof," but occasionally any piece of mechanical equipment will need servicing of some kind, no matter how slight.

To take care of these repair jobs the well-equipped mechanic's tool kit should include: 1—No. RF Refrigeration Set of Sockets and Ratchet for making packing gland nut

* Advertising Manager, Bonney Forge and Tool Works, Allentown, Pa.

adjustments, valve stem adjustments, Kerotest valve packing nut adjustments and an assortment of sockets with double-hexagon or 12 point openings for handling various size hexagon nuts that will be found on almost any refrigeration unit.

In addition, this set contains two ratchet plug adaptors, a 4-inch sliding "T" handle and a 4½-inch extension for use with the ratchet or "T" handle. It contains 19 pieces in all, weighs only 2 lbs. 3 ozs. and is packed complete in a strong, black enameled, pocket size metal box measuring only 7¾" x 3⅜" x 1⅛".

BOX WRENCH

In addition to this socket set, the following assortment of wrenches and tools is almost indispensable.

1—No. 142 Box Wrench with ⅜" and 7/16" openings
1—No. 144 Box Wrench with ½" and 9/16" openings
1—No. 146 Box Wrench with 5/8" and 11/16" openings
1—No. 148 Box Wrench with ¾" and 13/16" openings
1—No. 150 Box Wrench with ⅞" and 15/16" openings
1—No. 152 Box Wrench with 1" and 1 1/16" openings
1—No. 176 Offset Box Wrench with ⅜" and 7/16" openings
1—No. 177 Offset Box Wrench with ½" and 9/16" openings
1—No. 178 Offset Box Wrench with 5/8" and 11/16" openings
1—No. RF54 Flare Nut Wrench with ¾" and 1" openings
1—No. RF55 Flare Nut Wrench with ⅞" and 1⅛" openings
1—No. 161 TuType Wrench with 7/16" openings
1—No. 162 TuType Wrench with ½" openings
1—No. 163—TuType Wrench with 9/16" openings
1—No. 164 TuType Wrench with 5/8" openings
1—No. 165 TuType Wrench with 11/16" openings
1—No. 166—TuType Wrench with ¾" openings
1—No. 2725 Right Angle Wrench with 7/16" and ½" openings
1—No. 2727 Right Angle Wrench with 9/16" and 5/8" openings
1—No. 2030D Right Angle Wrench with 11/16" and 13/16" openings
1—No. 2732A Right Angle Wrench with ¾" and 1" openings
1—No. 1725 Engineers' Wrench, 7/16" and ½" openings
1—No. 1727 Engineers' Wrench, 9/16" and 5/8" openings
1—No. 1030D Engineers' Wrench, 11/16" and 13/16" openings
1—No. 1732A Engineers' Wrench, ¾" and 1" openings
1—No. 1734 Engineers' Wrench, ⅞" and 1⅛" openings

TU TYPE WRENCH

1—No. 1034A Engineers' Wrench, 15/16" and 1 1/16" openings
1—No. H18S Switch Adjusting Wrench for Frigidaire with 7/16" and 9/16" openings
1—No. B6—6" Combination Pliers
1—No. B12—6" Thin Nose Combination Pliers
1—No. B22—6" Lineman's Cutting Plier
1—No. C1 Flat Chisel, 5/16" Cut
1—No. C3 Flat Chisel, ½" Cut
1—No. C4 Flat Chisel, ¾" Cut
1—No. C28 Pin Punch, ⅛" Point
1—No. C30 Pin Punch, ¼" Point
1—No. C25 Long Taper Punch, 5/32" Point
1—No. C22 Solid Punch, 3/32" Point
1—No. C32 Prick Punch
1—No. C34 Center Punch
1—No. PH2—3½ oz. Ball Pein Gasket Hammer
1—No. PH7—1 lb. Ball Pein Hammer

In addition to the wrenches and tools listed above, to have a complete kit that will permit you to handle any servicing job that

VALVE STEM NUT WRENCH

comes along in the shortest time possible, your kit should also include a flaring tool of which there are several types on the market, a tube cutter, a good hack saw, tube bender, pinch-off tool, refrigerator fly wheel puller, one or two Stillson wrenches, a good hand drill with the necessary bits, reamers, countersinks, etc., an assortment of files, Allen set screw wrenches to take care of the sizes encountered most often and a good pocket thermometer.

Quite naturally some mechanics may feel the need for a greater variety of sizes of the

various type tools which have been mentioned above. It has been our thought to include only the sizes that are most generally needed to take care of present day refrigerators. Any jobber of refrigeration supplies and equipment usually carries a full line of tools and those mentioned will be found in his stock.

Like all other classes of merchandise, there are "cheap tools" and "high-priced" tools—so called. The so-called "high-priced" tool will cost slightly more to buy, but the additional service it gives when compared with the low-cost tool really makes it cheaper in the long run.

One thing you should be sure of, as a refrigeration service engineer, is the fact that your tool kit includes all of the tools which will permit you to handle the every day servicing job. One way of being sure that you have the proper tools for handling each job in the shortest possible space of time is to insist, when buying tools, that they be made by a manufacturer who is a tool specialist. Only in that way can you be absolutely sure that you are getting the tool that is best suited for your work. There are many manufacturers who include tools as a part of their line, but only a few who actually specialize in tools. It is from these few that you can depend upon receiving the right tool for doing the job.

Servicing the Fairbanks-Morse Refrigerator

(3rd Article)

Additional Instructions and Information on Replacing the Compressor Shaft, Checking Thermostatic Expansion Valve, Temperature Control Operation and Other Servicing Pointers.

AFTER removing the seal, as described in the previous article in the August issue, take off the base plate from the bottom of the compressor and, using a socket wrench, loosen the two cap screws which clamp the eccentric to the shaft. In the case of the twin-cylinder compressor, it is necessary only to loosen the one lock nut on the eccentric lock screw that passes through the body of the eccentric. The shaft can then be pulled out.

The new shaft can now be inserted. Make certain the eccentric is held in place and that the key lines with the eccentric. Make certain that the thrust ball bearing is in place. Do not remove eccentric from connecting rod unless necessary. If this is removed, make certain it is replaced in the exact position from which it was taken out, since oil groove is designed to operate with the groove as originally installed. See Fig. 11. In the twin-cylinder compressor, the eccentric lock screw which holds the eccentric on the shaft is ground on one side to conform with the shape of the shaft. When installing the shaft, place a screw driver in the slot provided on the end of the eccentric lock screw and turn it until the ground side is brought in line with the bore of the eccentric, after which the shaft may be inserted.

Refer to Fig. 10. Hold shaft tight against the thrust bearing and move the eccentric toward the left as shown in Fig. 10 to allow 0.010 in. clearance. This is very important to give proper seal tension.

Then tighten the two cap screws which clamp the eccentric to shaft or the lock nut on the eccentric lock screw that holds the eccentric to the shaft on the twin-cylinder compressor. Tighten these securely but do not use extreme pressure.

The bottom plate should now be installed, using a new gasket.

The seal assembly can then be installed as outlined.

Lapping Seal Face on Shaft

After the seal assembly has been removed, careful inspection should be made of the seal face on the compressor shaft. If this face is marked in any manner, the following

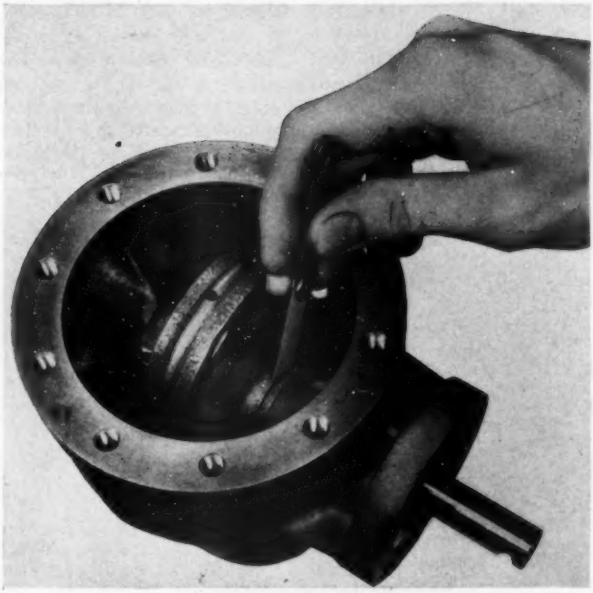


FIG. 10—ADJUSTING THE ECCENTRIC

method should be used in an attempt to remove the mark. The shaft should be removed from the compressor and clamped in a vise in a vertical position between two pieces of either copper, leather or wood so that no damage will be suffered by the shaft.

The lapping tool provided is designed to slip over the shaft from the flywheel side. A Flexbac 400 grit paper, supplied by the Carborundum Co., should be used for the lapping operation. This paper should be cut into 1½ to 2 in. squares. A hole equal in diameter to the small section of the shaft is then cut in the center of the paper so that the square will slide over the flywheel end of the compressor shaft. The lapping paper should now be dipped in the regular refrigeration oil and slipped over the end of the shaft. The seal face should now be polished, using a back and forth motion of the tool similar to the motion used when grinding automobile engine valves. If the paper has a tendency to slip, one corner of the square may be turned up and held against the tool with one finger.

At various times during this operation the tool should be removed and the face of the shaft washed with carbon tetrachloride so that inspection may be made of the results of this operation. If the seal is damaged to the extent that polishing will not remove the scratches or blemishes thereon, H-400 fine compound may be used on the paper to speed up the cutting effect of the tool. However, in cases of this kind, the surface must always be finished with the lapping paper provided for this operation. This operation should result in a seal face that has no marks of any kind. If the face is so badly damaged that the aforementioned operation will not return it to its original condition within a reasonable time, the shaft should be replaced.

Installing Connecting Rod on Eccentric

When assembling the connecting rod on the eccentric, the proper direction of rotation must be kept in mind. The arrow on the outside rim of the flywheel shows that the compressor should turn clockwise. Fig. 11 shows the proper position of the rod on eccentric. Note that the mouth of the oil dipper faces the proper direction of rotation (see arrow). The oil that is picked up by

the dipper is forced to the connecting rod bearing. As the eccentric rotates further, the oil is fed *first* to the groove in the connecting rod bearing and *second* is forced through the oil channel in the connecting rod. The oil is then forced up the oil channel to the wrist pin and wrist pin bearings.

serting the gauge in the hole, being sure that it touches the bottom of the compressor and holding the gauge as close as possible to an upright position. The minimum amount of oil with which the compressor should operate will bring the level to approximately one inch from the bottom of the compressor. The

FORCE FEED OIL DIPPER
FORCE FEED OIL GROOVE
RIFLE DRILLED OIL CHANNEL TO WRIST PIN
DIRECTION OF ROTATION
FLYWHEEL END OF ECCENTRIC

FIG. 11—PROPER POSITION OF ROD ON ECCENTRIC WHEN ASSEMBLING CONNECTING ROD

Checking Oil Level in Compressor

Install compound gauge and close the suction service valve by turning the stem to the right until it seats and allow the compressor to operate until back pressure shows zero to one pound. Repeat if necessary until the back pressure will remain at zero to one pound for several minutes with the unit shut off, at which time the discharge service valve should be closed by turning the stem to the right until it seats. Remove the oil filler plug located on the side of the compressor and, using a small piece of very hard wood, or a piece of wire, check the oil level by inmaximum amount of oil that should be in the compressor will bring the level to approximately two and one-half inches.

Caution: Do not add oil if level is at or above lower mark. If below, add only enough to bring level up to lower mark. If the unit has been completely discharged of refrigerant and oil, it will be necessary to add the correct amount of oil.

If it is necessary to add oil to the compressor, the recommended oil should be used and poured into the compressor crankcase through the filler plug hole. When the correct amount of oil has been added, the filler

plug should be replaced, using a new gasket. The compressor is then purged and the test is made for leaks around the filler plug. The unit may then be put in operation.

Repair of Motor

If the motor is free to turn but still refuses to start when the proper current is supplied to the motor terminals, the capacitor should be changed. If this does not remedy the trouble, the centrifugal switch should be checked. This starting circuit is energized through the operation of this centrifugal switch enclosed in the motor end bell. This switch is always closed when the motor is not running, thus engaging the starting winding for the next run. When the rotor gains sufficient speed, the governor which is fastened to the rotor opens the switch, disconnecting the starting circuit, the motor operates as an induction motor.

Often adjustments are necessary in spite of the fact that the switch is apparently making contact. This is due to the fact that the point is not making the slight wiping action necessary to keep the contact free from oxide and corrosion.

The contact points should be cleaned with an ignition point file or sandpaper. Do not use emery or carborundum papers.

To adjust this switch point, first disconnect the power; then remove the rear bell end of the motor. The contact to be adjusted is located in about the center of this section. To adjust the switch, bend the spring contact arm outward to assure positive starting contact. Whenever these motors are disassembled care must be exercised in assembly to assure proper switch operation. All shaft washers should be preserved in their order of disassembly so that they may be replaced in the same order. To reassemble motor so as to obtain proper switch adjustment, proceed as follows:

1. Remove springs and switch hub. Check governor weights to make sure they move freely. If the weights do not move freely due to having been damaged it is necessary to locate and remove the binding action before proceeding. Replace hub, making sure that it slides freely on shaft. Replace springs.

2. Assemble cork washer in its retainer (A) against shaft shoulder.

3. Assemble the two copper-plated washers next to cork washer.

4. Assemble sufficient steel washers on shaft so that when the weights are in the closed position with rotor inserted full distance in end-plate, that is, with washers resting against bearing shoulder, the switch contact will definitely touch. (If extra washers are needed, use steel washers from shaft extension end of rotor.)

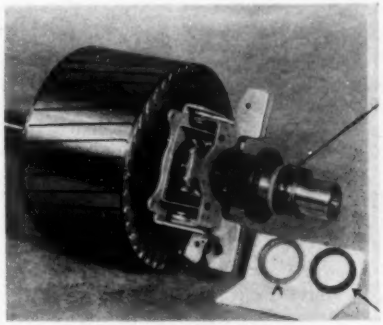


FIG. 12—ROTOR ASSEMBLY

5. When you are sure contact is established as described, remove rotor from end-plate and take off 3/32 in. of washers. This provides proper follow up of switch which is necessary for long life. Do not disturb this adjustment when end play adjustment is made per paragraph 8.

6. Re-insert rotor in end-plate with washers resting against bearing shoulder. Open governor weights by hand until they seat firmly against felt bumpers on the stops. The switch hub should definitely clear the moving contact.

7. Remove rotor and assemble front end-plate on motor in proper position. If leads to switch have been disconnected, the reconnection should be made before end-plate is assembled on frame. Care must be exercised to prevent lead interference with moving parts.

8. Cork and copper plated washers are to be assembled on shaft extension end similar to method outlined in paragraphs 2 and 3. Sufficient steel washers should be added so that all free end play is removed with back end-plate in place and through bolt nuts tightened.

9. Rotor should turn freely.

In the event that this procedure does not correct the difficulty, the motor should be replaced and the defective motor returned to the service station to be repaired.

The Belt

The "V" belt is a moulded rubber and fabric belt, giving long, quiet service if kept free of oil and properly adjusted. If the belt becomes oil-soaked in a spot, the rubber in that spot will swell, causing a hump in the belt, which results in noisy operation. The belt should be tight enough so that when the hand is placed midway between the pulley and the flywheel, and a slight pressure applied, the belt will give approximately ½ in.

To insure long quiet service, the motor pulley and compressor flywheel must be in line when the belt is installed. The pulley and flywheel may be lined up by installing the belt and sighting along it with the unit operating. At any time it is necessary to make adjustments, the Allen set screw that holds the motor pulley to the motor shaft may be loosened. The motor pulley may now be moved forward or back as is necessary to bring the pulley in line with the flywheel, after which the Allen set screw is carefully tightened down on the shaft of the motor.

If the faces of the belt become irregular because of being oil soaked, or split, the belt should be replaced. The bolts that hold the motor on the unit base should be loosened and the motor slid toward the compressor. The defective belt is then replaced by a new belt, after which the motor is slid back until the correct belt tension is established. The motor holddown bolts are then tightened. Check the alignment and the tension again before starting the unit.

Replacing Condenser and Receiver Tank

If for any reason it becomes necessary to make repairs on or to replace condenser, receiver tank or receiver tank valve, all of the refrigerant must be removed from the system. This is accomplished by following one of the procedures given under "Purging a system." When the system is emptied and replacement started, one or all of the following connections may be used: Solder connection; copper tube connection; receiver tank valve connection.

In making a solder connection, never apply heat to the joint until it is certain that the complete charge has been removed. To disconnect the condenser line from the receiver tank, it is only necessary to apply heat to the joint and remove the line when the solder melts. In making the joint, by the use of sandpaper or sandcloth, clean the outside of the copper tube at the end equal to the depth of the fitting. Do not leave any dark spots. Clean the inside of the fitting where joint is to be made until the surface becomes bright. Apply a coat of non-corrosive soldering flux to the outside of the tube and the inside of the fitting. Be sure that the flux is distributed evenly. Slip the tube into the fitting until it will go no further and turn back and forth once or twice to further insure an equal distribution of the flux. Use 50-50 wire solder. The diameter of the solder must be approximately the same size as the feed hole. Using a blow torch, melt a drop of solder into the solder feed hole. Apply heat around the fitting until the drop of solder disappears, indicating that proper temperature has been reached. Feed the solder through the feed hole until it appears around the end of the fittings.

For directions concerning the copper tube connections, see instructions regarding this in the first article.

Receiver Connections

For receiver tank valve connections, the receiver tank valve is screwed into the receiver tank and sweated in and at any time it is necessary to replace this valve the receiver tank and valve must be heated with a torch until the solder around the threads softens, after which the valve may be unscrewed. When installing the replacement valves, both male and female threads should be cleaned and tinned. While the solder is still soft the valve should be screwed into the receiver tank. A small amount of heat will have to be applied all during the operation, so that the solder will bond the receiver tank threads and valve pipe threads together, making a leak-proof joint when the valve is tightened in and allowed to cool. The unit should then be tested for leaks; and, if no leaks are found, it should be dehydrated and charged with refrigerant and oil in accordance with the instructions on that subject.

Checking Thermostatic Expansion Valve

This valve is completely sealed and cannot be repaired in the field. It contains a strainer inside of the inlet connection. This strainer is merely for the purpose of catching a few particles of dirt as might enter the tubing when a new valve is installed. For this reason the strainer is non-removable.

When servicing a machine, remember that the sole function of the thermostatic valve is merely to keep the coil completely filled with refrigerant. Always check for a shortage of refrigerant before removing the expansion valve. Furthermore, if the machine runs too long, it may be that one of the compressor valves is not functioning properly rather than trouble with the expansion valve. If there is sufficient refrigerant in the system and the evaporator is cooled from beginning to end without permitting the liquid to enter the suction line (frost back) it indicates that the valve is working properly. To insure proper operation of the thermostatic expansion valve, it is essential that the feeler tube makes perfect contact with and is tightly clamped to the evaporator. A loose or poorly clamped feeler tube will lead to erratic operation of the expansion valve and in extreme cases will permit the liquid to enter the suction line, causing frost back. If the temperatures are too warm, check to see that the temperature control is functioning properly.

Removing Evaporator and Expansion Valve

For removing the evaporator and expansion valve from the cabinet, proceed as follows:

1. Stop the unit by pulling out the service cord plug.

2. Close the receiver tank valve by turning the stem in a clockwise direction until it seats.

3. Defrost the evaporator by keeping the cabinet doors open. Remove the ice cubes and place hot water in the tube trays; place the trays in the evaporator to speed up the defrosting.

4. While waiting for the evaporator to warm up (it should be approximately room temperature) attach your compound gauge to the low side valve.

5. When the evaporator has defrosted: (a) Start the machine and allow it to operate until the compound gauge reads 20 inches. (b) Stop the unit. (c) The back pressure will increase again due to the fact that some liquid sulphur dioxide will remain in the line between the receiver tank valve and the thermostatic expansion valve. The passage of this refrigerant through the expansion valve may be hastened by placing the hand over the feeler tube of the expansion valve where it is connected to the evaporator. The heat of the hand will cause the expansion of the vapor in the feeler tube, thereby holding the valve open. Repeat (a) and (b) until the gauge will read zero (0) for several minutes with the unit turned off. Carefully wipe the expansion valve and fittings dry to eliminate the possibility of moisture entering the system when these parts are removed. (d) If the evaporator is to be repaired or replaced immediately, the compound gauge may be left on the machine. However, if replacement will not be made until sometime later, the gauge should be removed at this point. (e) Close the suction and discharge valves and proceed to remove the evaporator. (f) Remove the temperature control bulb from the clamp located at the rear of the evaporator. Remove the screws holding the evaporator front to the evaporator. Disconnect the wires running to the temperature control. (g) Disconnect the liquid and suction lines. (h) Remove the nuts holding the evaporator in the cabinet and remove the evaporator for repair or replacement. (i) The flare nut connecting the expansion valve should then be loosened. (j) Remove the feeler tube clamp, releasing the expansion valve.

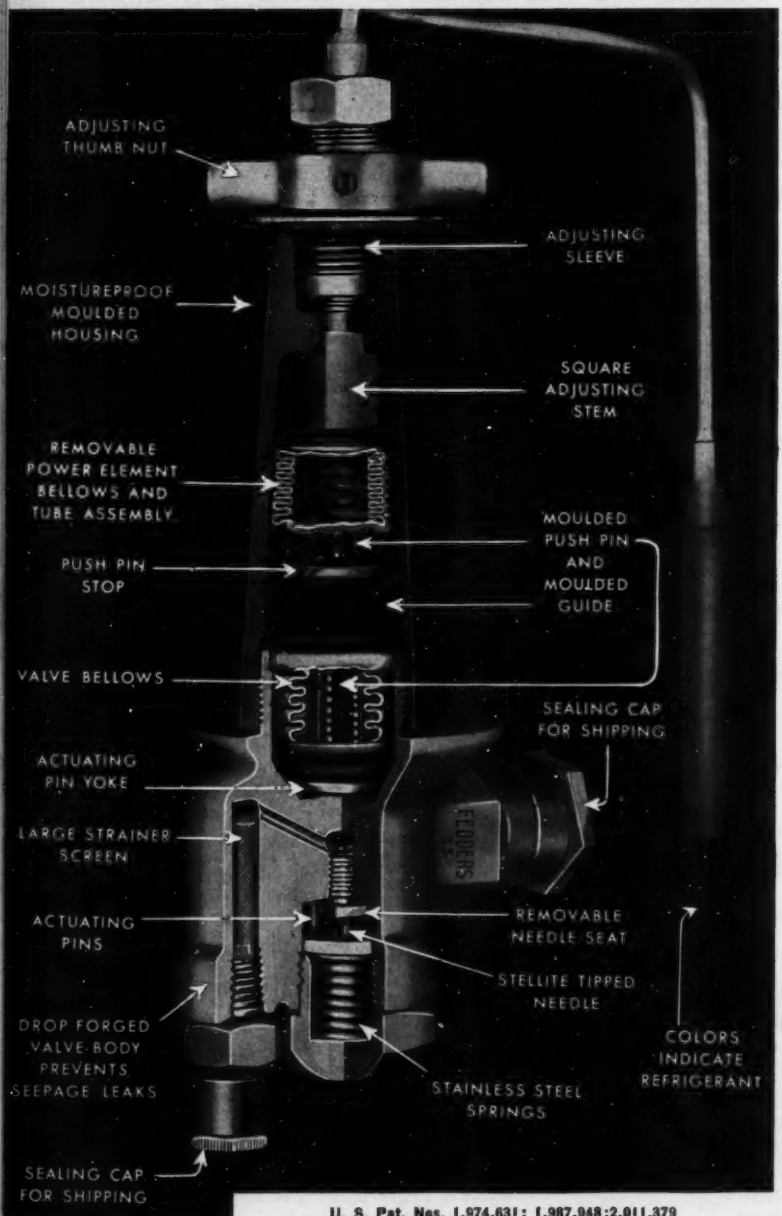
For installing the expansion valve, the outlet (larger fitting) of the expansion valve should be connected to the evaporator tubing. The feeler tube from the expansion valve should be carefully bent to correspond with the shape of the feeler tube on the valve that has been removed and clamped in approximately the same position on the evaporator as the original feeler tube was prior to its removal. The feeler tube must not touch the evaporator at any point except where it is clamped to the evaporator. The feeler tube must be tightly clamped to the evaporator.

Here is the INSIDE STORY of Why Refr... Servi... E... like ED...

Mode...

THERMOS...

EXPANSION...



The performan... you ... is the result of ... eng... into it. This ... away ... the Fedders Model 33... pansion Valve ... art fo...

It shows desig... and co... which give ea... sensit... curate refriger... cont... performance in ... fiel...

Fedders High ... Vapor ... ment assures p... itive ... complete temp... ature ... in modern refri... eratio...

Thousands of F...dders ... static Expansion ... Valve... and approved by ... every... are thoroughly ... eaned ... hydrated.

Standardize on ... Fedde... are sold by ... repres... everywhere.

FEDD...

114 E. 18th St., New Y...
711 Boyls..., Bos...

U. S. Pat. Nos. 1,974,631; 1,987,948; 2,011,379

Finned and Finless Coils • Fed-R-Vex Drain Baffles. • Unit Coolers. Ice Cube Making and Cabinet Cooling Evaporators. Condensers. • • Thermostatic, Automatic, Constant Pressure, Two-Temperature Snap Action and Check Valves. • Heat Interchanger Fittings. • Unit Heaters.

ARE YO...

Why efrigeration Servi Engineers like EDDERS

Model 33 THERMOSTATIC PANSON VALVES

performa you get out of a valve
e result of e engineering that goes
it. This away photograph takes
Fedders Model 33 Thermostatic Ex-
on Valve art for you.

ows desig nd construction features
n give ea sensitive adjustment, ac-
e refriger control and dependable
rmance in e field.

ers High Vapor Charged Power Ele-
assures p itive operation over the
lete temp ature range encountered
dern refri ration practice.

sands of Fedders Model 33 Thermo-
Expansion Valves have been proved
pproved by every test of time. They
oroughly eaned and absolutely de-
ted.

ardize on Fedders Valves . . . they
old by epresentative Suppliers
where. See list at right.

EDDERS

These Refrigeration Suppliers are at Your Service Everywhere

ATLANTA, GA.
Fedders Manufacturing Co.
M. D. Patterson Co.
BALTIMORE, MD.
Melchior, Armstrong, Dessau Co.
BINGHAMTON, N. Y.
Service Supply Co.
BOSTON, MASS.
Fedders Manufacturing Co.
Melchior, Armstrong, Dessau Co.
BRIGEPORT, CONN.
Parsons Bros.
BUFFALO, N. Y.
Fedders Manufacturing Co.
Beals, McCarthy & Rogers
Root-Neal & Co.
CHARLOTTE, N. C.
Henry V. Dick & Co.
CHICAGO, ILL.
Fedders Manufacturing Co.
Airo Supply Co.
The Harry Alter Company
H. W. Blythe Co.
Borg-Warner Service Parts Co.
George Monjian
H. Channon Company
CINCINNATI, OHIO
Fedders Manufacturing Co.
Merkel Brothers Co.
CLEVELAND, OHIO
Debes & Company
The Harry Alter Company
COLUMBUS, OHIO
Hughes-Peters Electric Corp.
DALLAS, TEXAS
Fedders Manufacturing Co.
Beckett Electric Co.
DAVENPORT, IOWA
Republic Electric Co.
DAYTON, OHIO
Allied Refrigeration Co.
DENVER, COLO.
Auto Equipment Company
DETROIT, MICH.
W. C. DuComb Company
FERNWOOD, MISS.
Enochs Sales Company
FORT WORTH, TEXAS
McKinley Refrigeration Supply Co.
GREENSBORO, N. C.
Home Appliance Service Co.
HARRISBURG, PA.
Melchior, Armstrong, Dessau Co.
HEMPSTEAD, L. I.
Home Oil Burner Corp.
HOUSTON, TEXAS
Walter Refrigeration Supply Co.
INDIANAPOLIS, IND.
Langsenkamp Company
JAMAICA, L. I.
Home Oil Burner Corporation
KANSAS CITY, MO.
Forslund Pump & Machinery Co.
Natkin & Company
LANCASTER, PA.
M. & E. Refrigeration Accessories Co.
LONG BEACH, CALIF.
Allied Refrigeration
LOS ANGELES, CALIF.
Fedders Manufacturing Co.
Franklin G. Slagel Co.
Pacific Metals Co., Ltd.
LOUISVILLE, KY.
Geo. Dehler, Jr. & Co.
MACON, GA.
Lowe Electric Co.
MEMPHIS, TENN.
United Refrigeration Supply
MIAMI, FLA.
Berner-Pease, Inc.
MINNEAPOLIS, MINN.
Refrigeration & Industrial Supply Co.
MONTGOMERY, ALA.
Teague Hardware Company
NEWARK, N. J.
T. W. Binder & Company
NEW ORLEANS, LA.
Enochs Sales Co.
The Spangler Company, Inc.
NEW YORK CITY
Fedders Manufacturing Co.
Melchior, Armstrong, Dessau Co.
The Harry Alter Company
Aetna Supply Co.
Paramount Electrical Supply Co.
Servicemen Supply Co., Inc.
PATERSON, N. J.
White & Shauger, Inc.
PHILADELPHIA, PA.
Fedders Manufacturing Co.
M. & E. Refrigeration Accessories Co.
Melchior, Armstrong, Dessau Co.
Victor Sales Corporation
PHOENIX, ARIZ.
Pratt-Gilbert Hardware Co.
PITTSBURGH, PA.
William M. Orr Co.
PORTLAND, ORE.
Stone Supply Co.
Refrigerative Supply, Inc.
Refrig. & Power Specialties Co.
RICHMOND, VA.
Refrigeration Supply Co.
ROCHESTER, N. Y.
Melchior, Armstrong, Dessau Co.
Pfaudler's Refrigerator Parts, Inc.
SACRAMENTO, CALIF.
The Refrigeration Store
SAN ANTONIO, TEXAS
Strauss-Frank Co.
Westbrook Carburetor & Electrical Co.
SAN DIEGO, CALIF.
Allied Refrigeration
SAN FRANCISCO, CALIF.
California Refrigerator Co.
Pacific Metals Co., Ltd.
Refrigerator & Power Specialties Co.
SANTA ANA, CALIF.
Allied Refrigeration
SEATTLE, WASH.
Refrigerative Supply, Inc.
Refrigerator & Power Specialties Co.
SPRINGFIELD, ILL.
United States Electric Co.
SIOUX CITY, IOWA
Refrigeration Supply Company
SPOKANE, WASH.
E. S. Matthews, Inc.
Refrigeration Parts Supply Co.
ST. LOUIS, MO.
The Harry Alter Company
Brass and Copper Sales Co.
The Spangler Company
R. E. Thompson Co.
ST. PAUL, MINN.
Thermal Service Co., Inc.
SPRINGFIELD, MASS.
C. P. Payson Co.
SYRACUSE, N. Y.
Syracuse Supply Co.
TORONTO, CANADA
Davis Automatic Controls Co.
TUCSON, ARIZ.
Glover & Clark
WASHINGTON, D. C.
Refrigeration Supply Co.
WILKES-BARRE, PA.
Radio Service Co.
VANCOUVER, B. C.
Fleck Bros., Ltd.
WHITE PLAINS, N. Y.
County Seat Plumbing Supply Co., Inc.

MANUFACTURING CO.
BUFFALO, N. Y.

th St., New Yo 2100 Arch St., Philadelphia 303 E. 6th St., Cincinnati 209 S. Pearl St., Dallas 603 W. Washington Blvd., Chicago
712 Boyls St., Boston 175 Luckie St., N. W., Atlanta 1501-1509 W. Eighth St., Los Angeles

E YOU GETTING YOUR COPY OF THE FEDDERS NEWS?

Installing Evaporator and Expansion Valve

When installing the evaporator and expansion valve in the cabinet, the evaporator and tubing may be purged by leaving the feeler connection at the suction service valve loose and allowing a small amount of sulphur dioxide to enter the evaporator and tubing by opening the receiver tank valve momentarily and then closing it. A leak test will show when the air has been blown out of the low side and sulphur dioxide is escaping. The fitting should then be tightened and the receiver tank valve opened. The suction service valve should now be opened and the pressure in the low side built up in accordance with the instructions given under testing for leaks and a complete test made for leaks at all points. If these tests show that there are no leaks, the evaporator front and temperature control may now be installed and the unit is ready to start.

Temperature Control Operation

The temperature control switch is operated by the action of the bellows (5) against the loading spring (3). The spiral bulb (8), the bellows tube, and the bellows are charged with methyl chloride, causing the bellows to exert pressure against the loading spring. This pressure is exerted at the bellows because it is the only part of the container that is flexible enough to yield to the pressure. When the proper size spring is installed in the control, there is an equilibrium between the two pressures.

If the temperature of the spiral bulb drops, the methyl chloride pressure will be reduced, allowing the spring pressure to force the bellows back. Conversely, if the

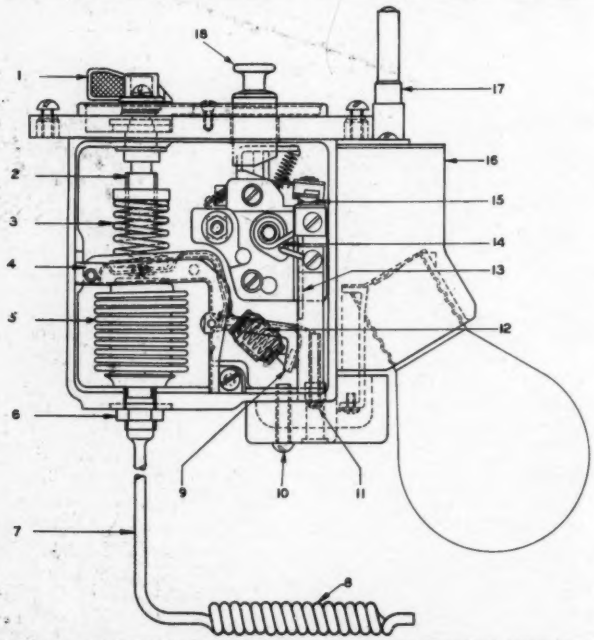


FIG. 13—TEMPERATURE CONTROL AND LIGHT SWITCH ASSEMBLY

1. Temperature control knob
2. Temperature control screw
3. Loading spring
4. Operating lever
5. Bellows
6. Bellows tube lock nut
7. Bellows tubing
8. Spiral bulb
9. Toggle lever
10. Screw for securing light unit
11. Differential adjusting screw
12. Transfer spring
13. Push bar
14. Heater coil
15. Silver contacts
16. Lighting unit
17. Light operating rod
18. "Start"-"stop" button and overload reset

spiral bulb temperature is increased, the bellows pressure will overcome the spring pressure, causing a movement in the opposite direction.

These changes operate the levers and toggle that throw the switch contacts, causing the control to cut in when the temperature rises and cut out when it drops.

These controls are set at the factory to cut in and cut out at the temperatures shown on the control case. These temperatures are the temperatures at the spiral bulb of the temperature control where it is inserted in the clamp situated on the rear of the evaporator and when the control is set at the No. 1 position, the normal position.

Therefore, when checking a temperature control, it is necessary to have a utility dial thermometer. The bulb of the thermometer must be clamped to the spiral bulb clamp, in which the spiral bulb is located, with the clamp provided for this purpose. The dial thermometer is then placed outside of the refrigerator and the doors carefully closed on the capillary tube of the thermometer. This assures a correct reading, provided that the doors are not open during a complete cycle of the unit. Variations of two or three degrees (plus or minus) should not cause alarm, for a discrepancy may easily be caused by one or more of the following conditions: Thermometer lag; the fact that clamping any device to the temperature control clamp conducts an abnormal amount of heat to that point and may raise the apparent cut-in and cut-out points ½ degree or more; changes in altitude affect the settings and there are times when the barometric change is equivalent to a 1,000-ft. altitude change.

The temperature is adjusted by moving the temperature control knob. Rotating the knob clockwise reduces the pressure of the loading spring to permit the bellows to operate the contacts at a lower temperature. Rotating the temperature control knob counter-clockwise increases the pressure of the loading spring to permit the bellows to operate the contacts at a higher temperature.

Temperature Adjustment

The temperature control knob may be used to adjust the operating range. The control knob is set at the factory to give the desired operating temperature. Travel of the knob is limited by a stop which fixes the operating range in the switch. The range can be changed by loosening the screw in the knob and then rotating the knob with respect to the shaft. No changes in temperature setting should be required for elevations up to 3,000 ft. It may be necessary to change the setting approximately .8 degrees for each additional 1000 ft. of elevation. This change should be made toward the warmer side of the normal No. 1 position indicated on the enameled escutcheon plate.

The temperature control has an indicating washer permanently attached to the shaft and by rotating this shaft clockwise the pressure on the spring which is in contact with the flexible bellows is reduced, thus lowering the temperature setting of the control. By rotating the shaft counter-clockwise the spring pressure is increased, which raises the temperature setting of the control without affecting the differential setting.

The pointer of the temperature control knob is in line with the small "V" notch in the indicating washer when the control is installed on the refrigerator, at the normal or No. 1 position on the nameplate.

If it is desired that the refrigerator operate at a colder setting than the No. 1 or normal position, rotate the temperature control knob and shaft clockwise or to the right of the No. 1 or normal position on the nameplate. Remove the disc from the control knob. Hold the knob firmly with the left hand while loosening the screw of the knob and then replace the knob so that the knob pointer is in line with the No. 1 or normal position on the plate, the small notch on the indicating washer still remaining at the position where the cold control knob was originally turned.

If it is desired that the refrigerator operate at a warmer setting, turn the knob counter-clockwise or to the left of the normal or No. 1 position on the nameplate. Hold the knob firmly while loosening the screw and return the knob so that this pointer is in line with the No. 1 position on the nameplate, the small "V" groove of the indicating washer remaining at the warmer setting.

The object of this explanation intensifies the fact that when the "V" groove of the indicating washer permanently fastened to the shaft is returned to the No. 1 setting, the control functions as originally set at the factory and, therefore, no matter where the pointer may be rotated on the control it can always be brought back to its normal setting. This is especially important and must be understood thoroughly by all service organizations. It is not necessary to install the control on the refrigerator or install the nameplate on the control to ascertain the No. 1 setting, as there is a marking on the control case, a small raised Bakelite line, which clearly indicates the No. 1 or normal setting.

Differential Adjustment

The differential (difference between the opening and closing of the contacts) is adjusted at the factory and sealed. In general there is no reason to change this adjustment as the box temperature can be changed by means of the cold control knob as described in the paragraphs preceding. This factory adjustment is made by a small differential adjusting screw located in the Bakelite shroud extending through the terminal cover underneath a small Bakelite disc. The differential adjusting screw limits the travel of the toggle lever, thereby providing adjustable cut-out temperature with fixed cut-in temperature. This screw if turned in too far may cause faulty operation or may hold the contacts open permanently. Turning the differential screw to the right, or clockwise, raises the cut-out temperature and turning the differential screw to the left, or counter-clockwise, lowers the cut-out point. One complete turn of the differential screw changes the setting approximately 1½° F.

Motor Overload Protection

This device consists of a hub to which a notched wheel is attached with a very low melting point solder, a pawl and a heater coil. The pawl is so arranged that when it is released by the notched wheel, it allows the switch to open, forcing the button on the control to the "off" position.

The overload heater coil is connected in series with the refrigerator motor. If the motor is overloaded for any reason, the power consumption of the motor increases. This increase in power through the circuit causes the temperature of the heater coil to rise. The heat generated by this coil heats the hub over which the coil is located. When the hub is sufficiently heated the solder connections between the hub and the notched wheel are broken. The notched wheel now revolves releasing the pawl. When the pawl is released, it allows the spring provided for this purpose to open the circuit.

When the circuit is broken, the heater coil and hub cools, and the solder will again grip the hub. When the pushbutton is again pushed into the "on" position, the pawl is forced over the notched wheel far enough so that it rests in one of the notches and is held there until the overload again becomes excessive. At this point the above operations are repeated and the circuit is opened again.

To prevent damage to the motor, due to the users' holding or tying down the pushbutton, a trip-free mechanism is incorporated in the control which will not allow the switch to close the circuit.

Interchangeable Heater Coils

A metal tag is attached to each overload heater coil, indicating the current (in amperes) that will trip the switch if allowed to pass through it for a short period of time. These coils may be changed so that the control may be used with any type of motor that is necessary. The proper coil to be used with various types and sizes of motors will be found in the parts list. It is very important for the protection of the electrical system that the proper coil be provided for the motor being used.

When installing the heater overload coils, care must be taken to see that the hub, over which the coil is placed, is in the center of the coil. If one side of the coil is allowed to approach or touch the hub, erratic operation of this safety device will result.

The fourth and final installment of this series of articles will be published in the next issue. It will cover instructions on replacing the light switch assembly, checking refrigerant supply, air in the system, purging sulphur dioxide and air, dehydrating and charging sulphur dioxide and oil.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 4 September, 1936 No. 9

RATES OF SUBSCRIPTION
In Advance, Postage Paid
UNITED STATES - - - - - - - - - - $2.00 a year
ALL OTHER COUNTRIES - - - - - $3.00 a year
Single copies, 25 cents

Advertising rates on application. Make remittances by postoffice or express money orders, international money orders, checks or drafts on Chicago or New York, payable to Nickerson & Collins Co., Publishers.

NICKERSON & COLLINS CO., *Publishers*
General Office.....433 N. Waller Ave., Chicago
Telephone Austin 1303, 1304 and 1305
Eastern Office.....149 Broadway, New York City
Telephone Barclay 7-8275

Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

AS IT SHOULD BE

RECENT reports carry the story of the action of a group of refrigerator distributors who formulated a resolution calling upon all refrigerator manufacturers to adopt some agreement on a plan whereby some of the extravagant guarantees now in force be placed on a sensible basis.

The problem seems so apparently simple of solution, especially to the larger manufacturers who have a wealth of merchandising experience, that the obvious action, as we see it, is to get together and adopt a policy of conservative service guarantees.

A strenuous objection has been made to the promiscuous length of guarantees advertised by manufacturers, which apparently is causing some difficulty among the distributors in satisfying their customers or explaining to them just what these guarantees mean. Of course, the distributor is feeling the brunt of this customer reaction. Nevertheless, the manufacturer in turn will feel this reaction because the customer is definitely reminded at all times of the manufacturers' product.

While the resolution in its final adoption suggested a uniform guarantee period of twelve months, there were some of the opinion that 90 days was sufficient time to amply demonstrate to the customer the performance of the unit.

The long guarantee advertising has caused some confusion among many purchasers. They assume that the guarantee covers service indefinitely for the length of time specified regardless of what the service complaint may be. In further discussing this matter, the dealers' organization brought out a point that was anticipated some time ago when these long-time guarantees were discussed—that it is difficult to control salesmen who, overzealous in their efforts to make sales, promise service for an indefinite period. When the consumer finds out actually what the guarantee covers, it is a difficult matter for the distributor to explain the situation.

We are of the opinion that the automotive industry has certainly set a good example. When they adopted a uniform 90-day warranty period, the public was perfectly satisfied that any defects in the mechanics of the car would show up in that length of time. Certainly, the lesson should be clear to the refrigerator manufacturer. It would seem, from a merchandising standpoint, inadvisable to continually bring to the attention of purchasers, the service required on refrigerators. Isn't this what salesmen call "negative" selling? There are so many other constructive arguments for selling, that the subject of service should be subordinated by comparison.

We must compliment the refrigerator manufacturer on some of the constructive selling which has been done, which we believe has contributed considerably to the popular conception that now prevails that the operation of mechanical refrigerators is economical, and that service, because of the fine design and quality workmanship, is secondary.

* * *

Walter Harvey
New Jersey

Received the 1935 issues, as well as the binder, which I consider the handiest kind, as well as the June number starting my new subscription. As a service man, I find the R.S.E. indispensable.

E. R. Davis
California

Haven't missed an issue since you started. Keep up the fine work.

Temperature Relations Between Evaporator, Refrigerator and Room

Practical Examples of how to figure Evaporator Temperature to maintain specified Box Temperatures

By GEORGE CLARK, B.S., M.E.*

OCCASIONALLY in refrigeration work special problems occur where it is desirable to have some method of determining how much coil may be necessary to produce a particularly unusual condition in a refrigerating cabinet and this particular problem involves a general study of the temperature relations that exist between the temperature of the room in which the refrigerator is to be located, the temperature to be maintained in the refrigerated space and the temperature at which the evaporator must be maintained to produce desired conditions.

If we have a household refrigerator located in a room at a temperature of approximately 80°, in order to maintain a cabinet temperature of 40° we may find it necessary to maintain an average evaporator temperature of 20°. The question sometimes arises then as to what cabinet temperature we may expect if the room temperature should increase to 100° or more if the evaporator remains at the same temperature. Or we may be interested to find out what the cabinet temperature may become if the outside temperature drops much below normal.

For instance, if the temperature around the refrigerator should be reduced to 50° or possibly 40°, are we liable to freeze foods in the refrigerator cabinet? Further, occasionally problems arise where we desire to chill a refrigerated space much lower than the refrigerator has been designed for and, in this case, some idea as to how low the evaporator temperature must be maintained is desired in order to maintain the desired cabinet temperatures.

In problems of this kind a simple proportion can be set up based on the temperature differences which occur between the evaporator and cabinet and the cabinet and the room. Illustrations of this possibly could best be found by mentioning a few problems and giving their solutions.

Suppose a household refrigerator is maintained at 40° in an 80° room with a 20° evaporator, and we desire to chill the cabinet down to a low temperature possibly for ice cream storage purposes and a cabinet temperature of 0° is desired.

First, we will write down the known temperature conditions with the refrigerator operating normally and then write down the known temperatures on the outside of the refrigerator and the desired temperatures on the inside and our problem is to find what evaporator temperature would be required. Thus we set the figures down as follows:

Evaporator	Refrigerator	Room
20° .... *20°*	.... 40° .... *40°*	.... 80°
.. ....*T.D.*	0° .... *80°*	.... 80°

In observing the above figures we note that the evaporator temperature in the case where we want the refrigerator temperature to be 0° is our only unknown and the temperatures given in the first case give us a definite relationship between evaporator, refrigerator and room for this particular combination.

We can say that the temperature difference between the evaporator and the refrigerator with a 0° cabinet is to the temperature difference between evaporator and the refrigerator when maintaining a 40° cabinet

* President, Detroit School of Refrigeration, Chairman National Educational and Examining Board, R.S.E.S.

as the temperature difference between the refrigerator and room when maintaining a 0° cabinet is to temperature difference between the cabinet and room with an 80° cabinet.

$$\frac{\text{T. D.}}{40°\text{-}20°} = \frac{80 - 0}{80 - 40} \quad \text{or T. D.} = \frac{80 \times 20}{40}$$

$$\text{or T. D.} = 40°$$

This indicates then that in order to maintain the cabinet temperature at 0° the evaporator temperature will have to be 40° lower than the cabinet temperature which would mean —40°. A —40° evaporator, of course, would be unusually cold. We could remedy this situation by increasing the amount of evaporator surface. For instance, the rate at which the heat passes from the refrigerator to the evaporator depends on the temperature difference between the refrigerator and the evaporator and on the amount of evaporator surface. Thus, if we could double the effective surface of the evaporator, we could cut the temperature difference in half and still pass the same quantity of heat. In other words, if we would double the evaporator surface, we would then require an average evaporator temperature of —20°. Redoubling this amount of surface would cut our temperature difference in two again to make a temperature difference of only 10° and would require an average evaporator temperature of —10°.

This problem may be illustrated or pictured by a simple analogy which consists in three tanks of water, *a*, *b*, and *c*, in which tank "*a*" is at an 80 ft. level, tank "*b*" at a 40 ft. level, and tank "*c*" at a 20 ft. level.

What we actually have in our refrigerator is a condition where the heat leaks from the outside of the refrigerator into the refrigerator. This is illustrated by a flow of water passing from the tank at the 80 ft. level to the tank at 40 ft. level. The tank at the 40 ft. level then passes the water to the tank at the 20 ft. level at the same rate it receives water from the 80 foot tank. If it did not pass the water from the 40 ft. tank to the 20 ft. tank at the same rate it was received from the 80 ft. level the level in tank "*b*" would be

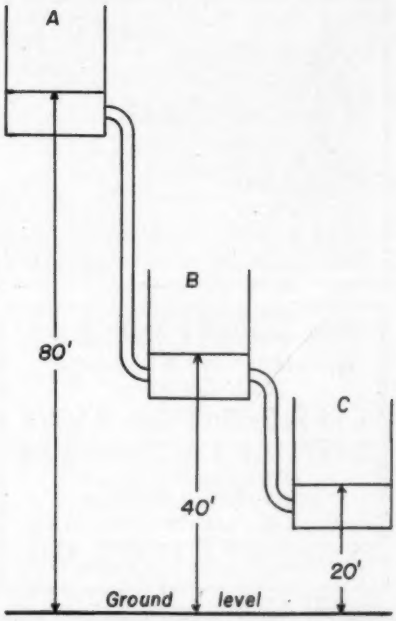
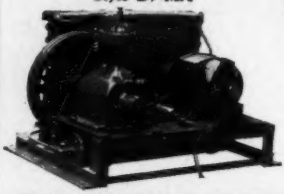


FIG. 1. SIMPLE DIAGRAM ILLUSTRATING TEMPERATURE RELATIONS

increased or decreased so that the difference in level would change until a state of equilibrium was reached when the water would pass from tank "*b*" to "*c*" at the same rate it was received from "*a*."

All the heat that leaks through the refrigerator walls and all the heat that gets into the refrigerator through a service load not dependent on the sensible heat of materials stored in the refrigerator must be passed to the evaporator and thus into the refrigerant. The refrigerant, of course, operates at a still lower temperature than the evaporator surface. In this instance where we say the average evaporator temperature is 20°, we might operate with a condition where the evaporator in one part of the cycle reaches a temperature of 25° and at another part of the cycle reaches a temperature of 15°. While the machine is in operation, the refrigerant temperature must be lower than the evaporator temperature so that the heat may flow or pass into the refrigerant.

Condensing Unit
Style D7-MA



STARR FREEZE

DEPENDABLE COMPRESSORS AND CONDENSING UNITS

1-2-4 Cylinders—⅛ to 10 H.P.

The most profitable and complete line to select from—just the size to build that refrigerator,—to assemble that condensing unit or to replace that old worn-out compressor.

Compressor
Style J

THE STARR COMPANY, Richmond, Ind., U. S. A.

222 N. Vermont Ave.
Los Angeles, Calif.

2025—1st Ave. North
Birmingham, Ala.

1222 Huron Road
Cleveland, Ohio

CARL **SCHNEIDER** CO.

"Serving the Middle and Southwest"

Complete Stock

REFRIGERATION PARTS SUPPLIES & ACCESSORIES

Office and Warehouse
2210 PESTALOZZI ST.

Two Stores:
2901 Missouri St.
4056 W. Pine Blvd.

COMPETITIVE PRICES

ST. LOUIS, MO.

Replacement
Gaskets

A real service for servicemen. We carry in stock, gaskets for old and new models of practically every unit ever built. All gaskets packed in uniform boxes, with manufacturer's part number and quantity. 24 hour shipping service.

CHICAGO-WILCOX MFG. CO.
7701 Avalon Ave., Chicago

Ordinarily the refrigerant temperature may be from 5° to 10° lower than the surface temperatures on the evaporator, depending on the design of the evaporator itself and upon the size of the condensing unit as compared with the capacity of the evaporator.

Thus, in this case, if we had a system which made use of a low side float valve or thermostatic expansion valve or any system, except an automatic expansion valve, at the instant when the temperature control started the machine the evaporator would be at 25° and the refrigerant would also be at that temperature since before the machine started the refrigerant will warm up to equal the evaporator temperature. When the machine starts, however, the refrigerant temperature will shortly be reduced to 20° at which time heat is passed into the refrigerant as fast as the evaporator picks it up and the refrigerant temperature will gradually be reduced to 10° while the evaporator temperature is being reduced to 15°.

Then the machine turns off and the refrigerant warms up to the evaporator temperature of 15° and from then on the evaporator

REFRIGERATION · AIR CONDITIONING

PARTS · TOOLS · SUPPLIES

LARGEST STOCKS • WIDEST SELECTION • FASTEST SERVICE

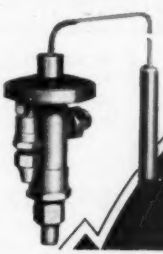
Wholesale Only

OUR CATALOG PROTECTS YOU · · SEND FOR IT NOW

133 N. WACKER DRIVE

H. CHANNON CO.

CHICAGO



EXPANSION VALVES

From the basic principle of its design to the completed assembly and inspection, every A-P Valve is a perfect unit which assures a trouble-free job on the particular application for which it was created. To eliminate service troubles, specify A-P Thermostatic Expansion Valves.

Write for complete Bulletin of types, sizes and applications

AUTOMATIC PRODUCTS CO.
121 N. Broadway Milwaukee, Wis.

and refrigerant warm up together. This, to some extent, accounts for the initial drop in pressure which may occur in a refrigerating system when the machine first starts and will also account for the initial increase in pressure when the machine first stops.

In completing our analogy of the water tanks with the problem we mentioned we might say that if we locate tank *"b"* at the 0° level, usually water will flow from the high tank to this tank at 0° level much faster than it did at the 40 ft. level due to the increase in difference in level between the two tanks. In fact, if there is no further restriction to the flow and the level difference is changed to 80 feet instead of 40 feet, water will flow through at twice the rate it formerly did and that means that water must flow from the tank *"b"* to tank *"c"* at twice the rate it formerly did which means that tank *"c"* would have to be twice as far below *"b"* as it was formerly provided the resistance to flow from *"b"* to *"c"* was not changed.

This means that where a 20 ft. difference in level formerly was sufficient 40 ft. difference in level would now be required, or this tank

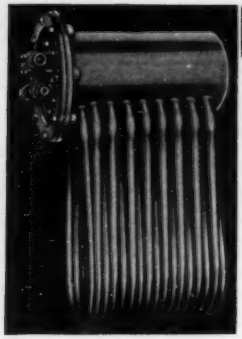
HERKIMER INSTITUTE
Advanced Courses for Service Men
REFRIGERATION—OIL BURNERS
AIR CONDITIONING
Requires six weeks' residence in the big city.
1819 Broadway **New York, N. Y.**

LEARN AT HOME: Subjects to complete a service man's education, e.g.,
☐ AIR CONDITIONING ☐ MATHEMATICS
☐ OIL BURNERS ☐ ELECTRICITY
☐ DIESELS ☐ PHYSICS
The above list is partial. Write for free complete catalogue of courses.
STUDY SYSTEMS
1819 Broadway **New York, N. Y.**

CHARGING VALVES FOR ALL HERMETIC UNITS
Including General Electric, Majestic, Cold Spot, etc. . . . These valves are constructed so that fittings can be readily replaced if worn. . . . Metallic packing insures leakproof valves. Stem adapters made of high grade steel. . . . Styles and prices promptly furnished upon request.
CYRUS SHANK CO.
625-631 Jackson Blvd., Chicago
Krupp Valves for Mechanical Refrigeration

TYPE "L"

BLUE RIBBON . . .
AUTOMATIC SUCTION PRESSURE THROTTLING VALVE
This valve installed at or near the suction inlet port of the compressor will relieve the serious difficulty experienced at times with practically every commercial installation, particularly flooded type systems—such as an overloaded motor condition due to high back pressures which are beyond the capacity of the motor to handle continuously without dangerous overloads. Conditions of this kind are indicated by abnormally high head pressures, frequency of cycling, blown fuses or burned-out motors.
WRITE FOR BULLETIN NO. 16 GIVING FULL INFORMATION.
AMERICAN INJECTOR COMPANY • Detroit, Michigan



STANGARD STANDS SUPREME

. . . . in the fine art of recalibration of float valves and the silver soldering of evaporation coils . . . for all makes of Ice Cream Cabinets.

WE MANUFACTURE AND REPLACE . . . Monel Tops Enamel Panels • Tanks Rims and Rim Sleeves . . . all other parts for all make cabinets.

STANGARD PRODUCTS
A Division of Standard Body Corp.
430 E. 104th Street, New York
Write for Details

would have to be located 40 ft. below ground level. If we do not desire to locate this tank so far down, we cut down the resistance to flow between tanks *"b"* and *"e"* by one-half possibly by adding another pipe of the same dimensions as the first one. With the same difference in level, then, we will pass water from one tank to the other at twice the rate. This would mean that in this case the lowest tank would be at a level 20 ft. below ground level which corresponds to the condition where we double the size of the evaporator to reduce our temperature difference between refrigerator and evaporator to 20°.

By putting four pipes between tanks *"b"* and *"e"* we could get a condition where only a 10 ft. difference in level would be required to pass the same amount of water. This corresponds to the condition where we increase the area of our evaporator four times so that we may operate it at —10° to obtain a 0° refrigerator.

If we were to operate our refrigerant between temperatures of 10° and 25° in the first case and we were to use methyl chloride, that would mean that we would set a pressure control to turn on at 17 pounds gauge and off at 9 pounds. Where we have changed our cabinet temperature to 0° and where we have increased our evaporator surface to four times the original amount and maintained this surface at a temperature of —10° average, we may find that we can operate the evaporator at temperatures of approximately 0° to —20° in which case the refrigerator temperature, provided our machine capacity was the same under this lower temperature condition, would be from 0° to —25° which on methyl chloride would give us pressures of 4 pounds on to 9 pounds off. This gives us an analysis of this type of problem.

Also in another case we have a household

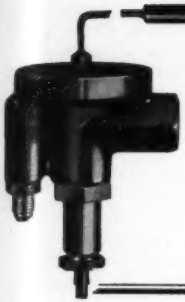
PARTS SUPPLIES TOOLS
COMPLETE STOCK
FOR REFRIGERATION AIR CONDITIONING

EVERYTHING YOU NEED FROM ONE SOURCE

No matter what parts, supplies or tools you may need for any type of refrigerator or air conditioner, our COMPLETE LINE can meet your requirements promptly. And it's all QUALITY MERCHANDISE. When you deal with Airo you know you can absolutely rely on getting exactly what you order. Airo prices are the very lowest rock-bottom wholesale prices obtainable. You get the benefit of our large volume and careful buying. Orders are shipped the same day received. WRITE FOR NEW, COMPLETE CATALOG. It's FREE.

FREE CATALOG AND BUYERS GUIDE

AIRO SUPPLY CO. 408-410 N. Wells St. CHICAGO, ILL.



PEERLESS THERMAL EXPANSION VALVES

for Methyl Chloride & Sulphur Dioxide

1. No bellows to leak.
2. No possibility of moisture condensation interfering with valve action.
3. Tried & proven in every section of the country.
4. Competitively priced.

PEERLESS ICE MACHINE CO.

CHICAGO — 515 W. 35th St.
TWO FACTORIES — NEW YORK — 43-00 36th St., L. I. C.

refrigerator which operates with cabinet temperatures of 50° when we have a 100° room temperature and a control setting of 15 pounds on to 8 pounds off using methyl chloride.

If we look up the temperature pressure relations of methyl chloride, we will find that at 18 pounds pressure the methyl chloride is at approximately 26° and the evaporator at the instant the machine first starts will be at the same temperature as the receiver so that the highest temperature in the evaporator will be 26°. At 8 pounds pressure the refrigerant temperature is approximately 9° and at the instant the refrigerator first turns off the refrigerant is 5° colder than the evaporator which means that the evaporator must be at 14°. Our average evaporator temperature, then, is an average of 26 and 14° or 20°.

It is desired that we adjust the pressure control so as to maintain a temperature of 40° in the cabinet while we have a 100° room. In this case we can set down figures for our proportions as follows:

Evaporators	Refrigerant	Room
20°	50°	100°
—	40°	100°

The temperature difference between the evaporator and the refrigerant in the latter case is to 30° (the difference between the evaporator and refrigerant in the first case) as 60° (the difference between the refrigerator and room in the last case) as 50° (the difference between refrigerator and room temperature in the first case) or, in other words,

$$\frac{\text{T.D.}}{30} = \frac{60}{50} \qquad \text{T.D.} = \frac{60 \times 30}{50} = 36°$$

$$40 - 36 = 4°\text{F.}$$

indicating that the average evaporator temperature is 4°.

To maintain an average evaporator temperature of 4° we may possibly desire our temperature to go to 14° at the instant the refrigerator starts and make it go to —6° when the refrigerator turns off. The refrigerant while the system is operating being 5°

Toss Out the OLD — Slip in the NEW

It's EASY with

EXACT REPLACEMENTS

THE Rancostat line includes far more EXACT Replacements! And even the General Replacement Units are a cinch to install. Write for NEW bulletin. Gives you the whole story.

RANCO, Inc., Columbus, Ohio

RANCOSTAT

WHOLESALE

Refrigeration Supplies

Complete Stocks Immediate Delivery

WRITE FOR OUR CATALOG

THE SPANGLER CO., INC.

3331 Market St. St. Louis, Mo.
623 St. Charles Ave. New Orleans, La.

Q.-A. REPLACEMENT PARTS

Toggle Shelf Hooks, Rubber Shelf Buttons, Cross Bars, Cross Bar Brackets, Tray Fronts, Clamps, Bushings, Universal Mounting Brackets, Etc.

I specialize in parts for "ORPHAN REFRIGERATORS"

A postal will bring Bulletin # 801

Colman J. Mullin, 52 Church St., N. Y. City

colder than the evaporator must then be at —11° while the evaporator is at —6° so that our refrigerant varies between temperatures of plus 14° and —11° which means that our pressure setting to give us these temperatures will vary from approximately 11 pounds on to 0 pounds off and this, thereby, gives a method of estimating what pressure or temperature settings may be required.

NEW TYPE FUSE CLIP CLAMP

SAFETY and economy being the two principal factors in the choice of electrical supplies, engineers and maintenance men will be interested in the improvements incorporated in the new line of Ideal Fuse Clip Clamps brought out by the Ideal Commutator Dresser Co., 1093 Park Avenue, Sycamore, Illinois.

These clamps are designed on an entirely new principle of applying pressure to the blades of fuse clips or switch clips. A steel clamping ring is forced over the outside of the jaws, exerting a tremendous pressure against the fuse or switch clips. This is done simply by turning the knob. It takes an equally firm grip on all clips, irrespective of width. The knob is a feature in itself as it has a knurled exterior to give a non-slip grip for the fingers.

Note the deep insulating skirt to shield against live contacts. This added safety factor is worthy of note, for in fuse removal and replacement, the need of safety can not be over emphasized; especially in view of the haste in which the work is so frequently done.

The new Ideal Fuse Clip Clamp cuts down resistance between clips and fuses or switch blades, eliminating considerable power loss. It prevents burning and pitting of fuses and clips due to poor contact, and is particularly useful on heavily loaded switches or fuse clips where fuse replacement is frequent. Among electrical engineers, it is generally recognized that sprung and uneven fuse clips become a menace and that to keep them permanently aligned, clamps are absolutely necessary.

DOOR GASKETS

for all makes of

REFRIGERATORS

EITHER ALL RUBBER or RUBBERIZED FABRIC

These gaskets are of the highest quality being furnished the Refrigeration Industry. They will not stain, are odorless, and are long lived. Write to us for samples giving your jobber's name.

Jobbers—This Line Is Profitable

JARROW PRODUCTS CORP.

420 N. LaSalle St. Chicago, Ill.

WRITE FOR IT TODAY!

Your letterhead or business card brings this big new 1936 Wholesale Catalog

FREE!

Bargains — New Items. Nationally known lines—everything for dealers or servicemen!

BURSTEIN-APPLEBEE CO.

1012-14 McGee St., Kansas City, Mo.

HERMETIC UNITS & PARTS REBUILT OR EXCHANGED

Majestic—all models	$20.00
Servel—all models	19.50
G. E.—all household models, 1 yr. guarantee	27.50
Majestic Standard Compressors, exchange price	6.50
Majestic thermostat, exchange price	2.50

SIX MONTHS' GUARANTEE

Wholesale Only

REFRIGERATION PRODUCTS INC.

122 W. Illinois St., CHICAGO, ILL.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Memphis Invites Every

Service Man, Manufacturer and Jobber

3rd Annual Convention

Refrigeration Service Engineers Society

Memphis, Tenn. November 11, 12 and 13, 1936

EVERY service man interested in the future of the servicing business is extended a REAL SOUTHERN INVITATION to meet with other progressive service men from every section of the country and participate in the three-day educational conference.

Your association—the REFRIGERATION SERVICE ENGINEERS SOCIETY—was founded for the principal purpose of rendering a definite service to everyone engaged in this business. As an active service man—whether a member or not—this is your invitation to come to Memphis and participate in the inspirational and educational activities which will return you to your work fortified with practical ideas to help you in your future activities.

The Educational Program

The educational program is the most important part of the convention. It will include the presentation of papers and time for discussion by the foremost authorities in their respective fields. Here is the unequalled opportunity to get first-hand information on subjects you are most interested

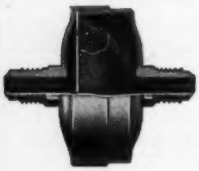
ONLY HENRY

Makes the Most Complete Line

HENRY VALVE CO.

TRADE MARK

Write for New Catalog 51: Strainers, Dryers, Line Valves and Service Tools



TYPE 890 SMALL STRAINER

With cup-shaped screen having 50% more capacity than usual flat disc. Soldered copper shell.

FLANGED SHELL

Dehydrator With Dispersion Tube

Less pressure drop. More efficient. Easier to refill. Copper shell. Forged steel distortion-proof flange. Tongue-and-groove, recessed-gasket joint. Shell diameters: 2" to 4⅛" Dehydrant capacity: 13.5 to 230 cu. in. Flare or union solder type fittings.

"Y" STRAINER

For Copper Pipe

Exceptional design. Negligible pressure drop. Accessible clean-out flange. Large screen area. Light weight. Baffle prevents injury to screen. Oil trapping prevented by installing on side or in vertical position. Liquid lines: 80 mesh. Suction lines: 50 mesh.

SOLD BY ALL LEADING JOBBERS

Henry Valve Co.

1005-19 N. Spaulding Ave., Chicago, Ill.

in. The Program Committee is carefully preparing the program to be of the utmost value to every man engaged in the business.

The Manufacturers' Exhibits

Some forty manufacturers, representing the outstanding firms in the field, have reserved space and are preparing educational exhibits for your inspection and will maintain trained engineers in charge to answer any questions which you may have. The manufacturers and jobbers who will be represented at this convention include the following:

Airo Supply Co., Chicago, Ill.
Alco Valve Co., Maplewood, Mo.
Harry Alter Co., Chicago, Ill.
American Injector Co., Detroit, Mich.
Ansul Chemical Co., Marinette, Wis.
Automatic Products Co., Milwaukee, Wis.
Copeland Refrigeration Corp., Detroit, Mich.
Curtis Refrigerating Machine Co., St. Louis, Mo.
Cutler-Hammer Co., Milwaukee, Wis.
Detroit Lubricator Co., Detroit, Mich.
Dole Refrigerating Co., Chicago, Ill.
Fedders Mfg. Co., Buffalo, N. Y.
Frigidaire Corp., Dayton, Ohio.
Fulton Sylphon Co., Knoxville, Tenn.
General Electric Co., Cleveland, Ohio
L. H. Gilmer Co., Philadelphia, Pa.
Henry Valve Co., Chicago, Ill.
Imperial Brass Mfg. Co., Chicago, Ill.
Kellogg Compressor & Mfg. Co., Rochester, N. Y.
Kerotest Mfg. Co., Pittsburgh, Pa.
Mills Novelty Co., Chicago, Ill.
Mueller Brass Co., Port Huron, Mich.
Peerless Ice Machine Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa
Perfection Refrigeration Parts Co., Harvey, Ill.
Ranco, Columbus, Ohio
R & H Chemicals Dept., Wilmington, Dela.
Rotary Seal Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Snap-On Tools, Inc., Kenosha, Wis.
Standard Refrigeration Parts Co., Chicago, Ill.
Starr Co., Richmond, Ind.
Tecumseh Products Co., Tecumseh, Mich.
Virginia Smelting Co., West Norfolk, Va.
Wolverine Tube Co., Detroit, Mich.

Entertainment Features

"All work and no play makes Jack a dull boy;" however, such will not be the case in Memphis. The Entertainment Committee has planned a full program of entertainment

REMPE
FIN COILS
for Commercial Use
Rempe Co. • 340 N. Sacramento Blvd. • Chicago, Illinois

features to occupy the attention of everyone when the business sessions are not being held. Trips to points of interest among other things, that have made the South famous, will occupy the attention of the delegates.

Bring the Ladies

The ladies are extended the same invitation to attend the convention and are expected to be present in large numbers. The Ladies Entertainment Committee is busy planning the various activities which will occupy their attention while the convention is in session. You can be assured of a most pleasant and memorable visit to Memphis.

Hotel Reservations

The convention sessions and exhibits will be held at the Hotel Gayoso—the official convention headquarters. Please make reservations direct to the Managing Director, Hotel Gayoso, Memphis, Tennessee, mentioning the REFRIGERATION SERVICE ENGINEERS SOCIETY convention. Because of the demand, early reservations are advisable.

The important thing is for you to make your plans to be in Memphis on November 11 and partake of Real Southern Hospitality.

We guarantee you will remember your visit to Memphis.

MEMPHIS NOTES

By **W. HALL MOSS, 2nd National Vice-President**

MEMPHIS CHAPTER has been busy planning for our National Convention. We want to assure everyone that our arrangements are all complete, and we are anxiously awaiting your arrival in Memphis so you may see for yourself.

Our Chapter was very pleased to have Mr. C. M. Speilman of Ranco, on July 20, who gave a lecture and demonstration on Ranco products. This lecture was very instructive and enjoyed by all. It was the type of meeting that tends to build up Chapter attendance and get the members enthusiastic about the work of the organization. Beer and sandwiches were served after the close of the meeting.

On September 7 Memphis Chapter welcomed Joe Askin of the Fedders Manufacturing Company. Joe is well-known in the refrigeration fraternity and we can say "he knows his stuff." We were glad to have him with us.

Announcing
The Scurlock Krisperette —
The Latest in Hydrators

At last, a glass hydrator, which makes possible a clear view of its contents, and eliminates the need for groping blindly to find the last tomato or bit of parsley. This attractive new addition to refrigerator accessories is made in clear crystal glass, and is a convenient size, 12" long, 7" wide, and 4¾" deep, and is especially easy to use because of its transparency and double covers. No need to remove from the refrigerator to get what you want. Pull it out about a third of the way, and remove one of the covers, and there you are. A wonderful item for jobbers and dealers.

Scurlock Kontanerette Corporation
1477 Merchandise Mart, Refrigeration Dept., Chicago, Ill.

KRAMER
COIL PRODUCTS
—A Complete Line
Send for Catalog
TRENTON AUTO RADIATOR WORKS
TRENTON, N. J.
Kramer Auto Radiator Corp., New York, N. Y.
Kramer Auto Radiator Co., Pittsburgh, Pa.

Same Day Service
on Ammonia Fittings
Refrigeration Parts
Tools and Supplies
WRITE FOR OUR CATALOG
H. W. BLYTHE COMPANY
PHONE CALUMET 2328
2334 S. MICHIGAN AVENUE, CHICAGO

Made to Do the Job Right

IDEAL THERMO-GRIP PLIERS
Soldering — sweating joints made easier. Better work quicker. No burner required. Work in cramped places—any position. Complete facts are yours—Write
IDEAL COMMUTATOR DRESSER CO.
1093 Park Avenue SYCAMORE, ILLINOIS

Don't Wish for Success
TRAIN FOR IT
U.E.I. training in Electric Refrigeration provides just the knowledge you need. It is interesting, thorough, practical, authentic. You study at your convenience in the privacy of your home.
Place yourself head and shoulders above rule of thumb mechanics. Be a technically trained Refrigeration Technician.
Interesting and valuable facts FREE for the asking. Write today.
UTILITIES ENGINEERING INSTITUTE
404 N. Wells St. Chicago
17 W. 60th St. New York, N. Y.

Boyd Evans of the United Refrigerator Supply Company of 366 S. Main St. says he has no complaint with the refrigeration business this year and is pleased with the confidence the boys have in him and his organization. Boyd is active in promoting the coming convention, and through his courtesy we have been enjoying refreshments and sandwiches during the past few meetings. Thanks, Boyd!

Mr. Howell E. Adams of the Lewis Supply Company, who heads their refrigeration supply department, is another one of our progressive distributors and reports a healthy increase in business over the preceding year. Howell recalls his pleasant time at the Detroit convention and extends a personal invitation to all of our R.S.E.S. members, wherever they may be, to attend the Memphis convention.

Mr. John McGregor, president of McGregor's, Inc., the live Frigidaire distributor of Memphis, is happy over the business that this season has brought him, and the prospects for future business this year. Mr. McGregor is one of the large distributors, giving his whole-hearted support to Memphis Chapter and the coming convention. We appreciate his cooperation.

There have been several changes in the personnel of various other refrigeration dealers, supply houses and distributors. In some cases the members of these companies have gone into business for themselves, and their reports are that business has been better than expected.

* * *

"THE 'CONTRIBS' COLYUM"

By "THE KINGFISH"

Well, Chicago Chapter had their picnic and everybody had a good time. The well-known George Monjian had his opera hat and cane along and took a fancy "belly-flop" from the diving board into the muddy waters of Sauk Lake, hat, cane and all, and a large red spot marked the place where the water hit George. Everybody was playing Hi-Li or Bo-Lo or something—these new paddles were furnished by the Chicago Chapter—prizes for the men and ladies and all the children. "Pop" and beer were also served free. The

usual games of soft ball, horseshoe pitching and cards were played and as far as we hear the day was a huge success.

* * *

This is the time of vacationing and our good Secretary McDermott spent his vacation somewhere in Wisconsin where he learned to ride horseback and eat fish. Which is more comfortable, Mac, the Studebaker or a nice circus horse?

* * *

MISSING PERSONS BUREAU: Herbert Herkimer of New York City, 5 feet 11 inches, 160 lbs., grey eyes, last seen on October 13th in Chicago when he was carrying a paper with symbols for the refrigeration industry. Anyone knowing his whereabouts please communicate with this colyum. That goes for you, too, Herbert.

* * *

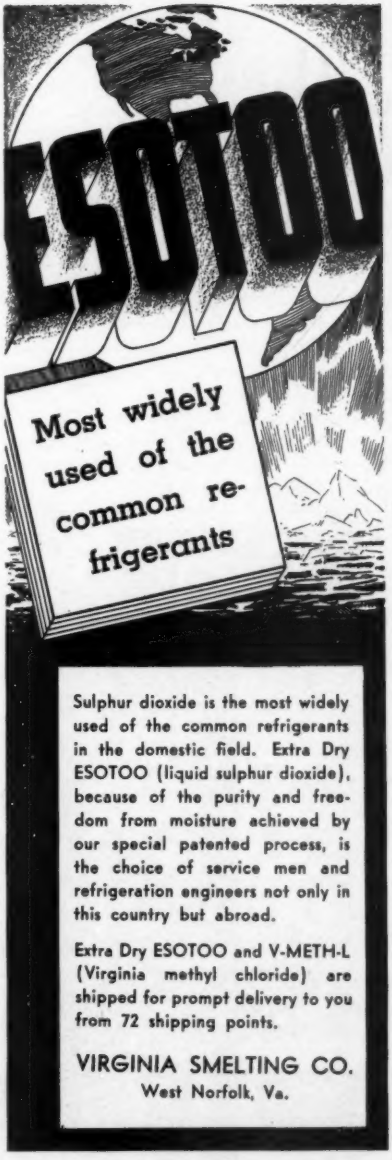
The trailers are popular among the Chicago boys. The Busbys went to Marion, Indiana, in one, and Oscar Heide from Complete Refrigeration Service went to Canada on a fishing trip in another one. Say, how big were the fish that got away, Oscar?

* * *

Wonder how many amateurs there are in the various chapters—that is amateur entertainers or actors. You know there will be an amateur night during the convention in Memphis and the Committee is waiting to find out how many of you want to get in on that. There will be prizes and lots of fun.

* * *

It is amusing to note the change of opinion about small refrigeration units among the old-time ammonia engineers. A couple of old friends, who have been chief engineers in the East for many years, visited us a few days ago on their vacation tour of the Middle West. These same engineers used to laugh at us when we spoke of SO_2 and methyl chloride, but now after ten years of changes and improvements they discussed with us again these "toy" machines. It seems that small units have invaded the larger plants on portable machinery and special applications and the old chiefs have found out that there are other refrigerants than ammonia and carbon dioxide.


ESOTOO
Most widely used of the common refrigerants
Sulphur dioxide is the most widely used of the common refrigerants in the domestic field. Extra Dry ESOTOO (liquid sulphur dioxide), because of the purity and freedom from moisture achieved by our special patented process, is the choice of service men and refrigeration engineers not only in this country but abroad.
Extra Dry ESOTOO and V-METH-L (Virginia methyl chloride) are shipped for prompt delivery to you from 72 shipping points.
VIRGINIA SMELTING CO.
West Norfolk, Va.

We suppose that you have serviced more machines in the last four months than you do in the other eight months of the year, and that you have run across some old and peculiar models of domestic refrigerators.

We should like to hear about the real old domestic refrigerators still in operation which you service in your community. When we say old, we mean machines from 1922 or earlier models. We should like to hear about their performance, how the people are satisfied with them, the make and model, the type of motor used, the kind of refrigerant used; is it a remote or self-contained installation; room temperature where the machine is located, and temperature where cabinet is located. In other words, we want to know everything about these machines, including the original cost and cost of operation and maintenance.

For each story accepted, preferably with a picture of the system, we will send you a binder for your copies of THE REFRIGERATION SERVICE ENGINEER.

ST. LOUIS CHAPTER

Meeting of July 23, 1936

By E. A. PLESSKOTT, *President*
2145 67th St., St. Louis, Mo.

THE regular meeting of St. Louis Chapter of July 23 was held at Joe Garavelli's Restaurant. Dinner was served at 7:00 P. M., after which Mr. C. A. Myers, Kelvinator engineer, explained in detail the conditioning installation in operation here. The members were then taken to the "machinery room" where inspection and further information was given them.

The program for our next meeting was outlined, and there being no further business, the meeting was adjourned.

Meeting of August 27, 1936

The regular meeting of August 27th was called to order at 7:45 P. M. at Joe Garavelli's Restaurant, after a hearty dinner.

Prior to introduction of the speaker of the evening, Mr. Plesskott introduced Mr. L. H.

Only as Efficient as
THE GASKET THAT SEALS IT

Miller has developed 20 door gaskets which fit practically all cabinets built in the last five years. Write for illustrated price list.

You can make money with Miller Refrigerator Gaskets. *If your local jobber cannot supply you, write direct.* Miller Rubber Company, Inc., Akron, Ohio, U. S. A.

Miller
"Engineers in Rubber"

Dally, sales representative in this territory for the Imperial Brass Mfg. Company, who gave a brief outline of the program for our meeting of September 24, at which his company will be host, and invited all present to attend and bring their problems along, as Mr. R. A. McIntosh and Mr. W. A. Leonard, factory engineers, would be in attendance.

Mr. Gygax, our educational chairman, then introduced Mr. F. B. Fillo of the Minneapolis-Honeywell Regulator Company, who gave a talk on controls. This was followed by a series of films accompanied by a voice explaining the various hook-ups in detail. All in all it was most instructive and gave a concise picture of one of the problems confronting the service engineer in the near future when air conditioning becomes more common.

President Plesskott spoke about the coming picnic and also "Imperial Night," urging all to make a special effort to attend both, after which the meeting was adjourned.

Our deepest sympathy is extended to Vernon E. Schaefering in the death of his mother — Amanda A. Schaefering — on August 25, 1936. Funeral services were held on August 28, with interment at St. Peter's Cemetery.

CHICAGO CHAPTER

Meeting of August 11, 1936

By PAUL JACOBSEN, *President*
8133 Crandon Ave., Chicago, Ill.

THE meeting was called to order at 8:30 P. M., at which following officers were present: Messrs. Jacobsen, Skipple and Bossert.

Due to the small attendance at this meeting it was decided to dispense with the business session and to make it an informal evening.

All sorts of questions were brought up for discussion, and everybody present had something to say and expressed their views on matters pertaining to both the Society and to business.

Final arrangements were made for the picnic which is to be held on August 16 and which promises to be an enjoyable affair.

The Stevens Hotel furnished an air-cooled meeting place, and in spite of the heat everyone present was comfortable.

Meeting of August 25, 1936

The meeting was called to order at 8:30 P. M. Officers present were: Messrs. Jacobsen, Skipple and Hendrickson. The minutes of the previous meeting were read and approved.

A motion was made by Herman Goldberg that one-third of the money made last spring at the annual banquet be retained by the Entertainment Committee for special purposes, and that the other two-thirds be turned into the regular treasury. Motion was seconded by Joe Corso and carried unanimously.

It was decided that the dues for the balance of the year be reduced to $7.50, including the initiation fee. This decision was made so we might gain as many new members as possible before the National Convention.

The Entertainment Committee announced that we are to have a "stag" sometime before the convention, and the latter part of October was decided upon as the best.

An interesting talk on what the Perfection Refrigeration Parts Co. stands for and an outline of their policies, was given by Mr. Ellis, who is a representative of the company. Chief Engineer Stock answered all the questions and told about the quality of their products.

CHICAGO CHAPTER CHATTER

By HERMAN GOLDBERG

GREETINGS from your long lost commentator.

—Before going any further, I wish to deny emphatically that I am that mysterious "bogie-man," the Kingfish. This is meant for all my friends who have written me during the past several months wondering if I was that fellow who is so adept as a scandal-monger.

—This summer has marked quite an important change for one of the most popular members of the Chicago chapter. Our very good secretary, Harry Busby, has transferred himself to Marion, Indiana, where he will take up the duties as superintendent of the refrigeration division of the organization which has purchased the rights to use the name of Majestic and Grigsby-Grunow in the assembling of refrigerators. This was a wonderful opportunity for Harry and he gave up a very lucrative business to take it, and without question a better man for the job could not be secured any place in the country.

—Sights at the picnic: Joe Corso's beer drinking capacity. George Monjian wearing a silk hat and a cane and little else. The nudist colony must have been pretty close. Paul Jacobsen using a 30-inch bat trying to hit a 16-inch indoor and missing by 36 inches. We could go on forever along these lines, but what's the use? All the beer and pop disappeared and everybody went home.

—There were a lot of sights during the tremendous auction held at the Majestic plants. One of the most inspiring was that of the owners of two of the largest shops in the middle west standing over the counters in what appeared to be a very serious conversation. Now I wonder, were they considering buying up the Majestic equipment, or what? My suspicions can be lulled by a couple of good cigars.

—As chairman of the Entertainment Committee, I wish to announce that we are going to run our smoker stag during the month of October and it is going to be a "lollapaloosa." Prepare yourselves in advance to have a good time. More about this later.

—Our National Convention in Memphis from all appearances will have twice as great attendance as our very successful convention last year in Detroit. More of the boys from the Chicago chapter will be up at this convention and we shall have a good time, so prepare yourselves to be there.

PITTSBURGH CHAPTER

Meeting of August 10, 1936

By F. V. GOLITZ, *Secretary*
1518 Davis Ave., Pittsburgh, Pa.

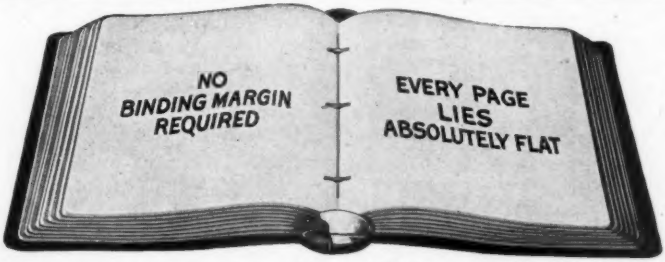
THE regular meeting of the Pittsburgh Chapter was held on August 10 in the Corporation Room of the Commonwealth Building. In the absence of President McCauley, Vice-president E. V. Black presided.

The minutes of the July meeting were read and approved as read.

The office of Treasurer was discussed. A

BIND—your copies of
THE REFRIGERATION SERVICE ENGINEER
for Future Reference

ALL COPIES ARE PUNCHED TO FIT THIS BINDER



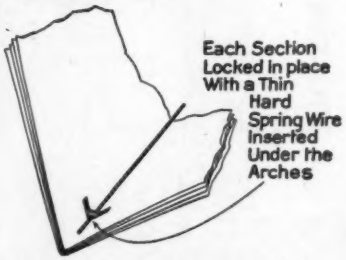
Every issue of this magazine will have valuable information which you will want to retain for future reference.

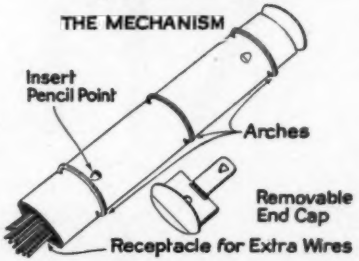
Here is a handy, substantial binder that permits you to add each copy readily as it is received. The binder is so constructed that regardless of the number of issues, every page lies flat and is easily read.

Holds twelve issues—an entire year's supply. No hunting around for lost or missing issues. The entire year's edition is always handy.

The name of the magazine is attractively stamped on the cover in gold.

HOLDS TWELVE COPIES
Only $1.25 Postpaid





It's simple—here is how it works

Each issue is locked in place with spring wire. It takes only an instant to add an issue. Reserve supply of extra wires for future issues is kept in the back-bone of the binder. File your copies promptly as received.

Send Your Remittance of $1.25 to

THE REFRIGERATION SERVICE ENGINEER
433 NORTH WALLER AVE. CHICAGO, ILL.

motion was made by Mr. Kirch, seconded by Mr. Ross, that due to the lack of interest, non-payment of dues and non-attendance at meetings on the part of Mr. Kane he is ineligible to hold office; therefore the office of Treasurer be declared vacant. Motion was carried.

Mr. Kirch moved, and Mr. Croston seconded, that an election be held for the office of Treasurer. Motion carried. The names of Mr. Ricci and W. H. Barnes were placed in nomination and a motion by Mr. Barbagallo and seconded by Mr. Gunnell closed the nomination. After the balloting the tellers—Messrs. Kirch and Gunnell—announced the election of Mr. S. A. Ricci. The Secretary was instructed to notify both Mr. Kane and Mr. Ricci.

The Membership Committee reported favorably on the application of Mr. R. P. Weston. Three applications for membership were referred to Chairman V. C. Waight for action.

The Secretary was instructed to contact railroads, bus companies, and the Chamber of Commerce for rates for transportation to the Memphis Covention. From all indications Pittsburgh will be well represented at the Convention. Pittsburgh serves notice on the Chicago Chapter that they will have to fight for the 1937 convention. The slogan of the Pittsburgh delegation will be "Pittsburgh in 1937."

Mr. H. A. Biber, a member of Pittsburgh Chapter, and engineer in charge of the air conditioning at the Mellon Bank, invited the members to inspect the installation of the Ingersoll-Rand Centrifugal Vapor Air Conditioning Unit. This 200-ton job has many unique features and should prove interesting to members. The inspection trip has been scheduled for Monday, September 14, immediately after the business meeting.

* * *

CHANGE IN R.S.E.S. CONSTITUTION AND BY-LAWS TO BE ACTED UPON AT CONVENTION

PURSUANT to the provisions of the Constitution and By-Laws of the Refrigeration Service Engineers Society regarding amendments to said Constitution and By-

MILLS

COMPRESSORS

for Commercial Use

Mills Novelty Co. • 4100 Fullerton Ave. • Chicago, Ill.

Laws as covered in Article IX of the Constitution and Article XIV of the By-Laws, notice is hereby given to the membership that a revision of the Constitution and By-Laws has been submitted to the National Society, and the National Secretary has been instructed to publish the proposed changes in full.

Action upon this matter will come before the convention regarding these changes at its annual meeting to be held in Memphis, Tennessee, November 11, 12 and 13, 1936.

The changes proposed are indicated by an asterisk (*) appearing before each section. Otherwise, the Constitution and By-Laws remain as previously.

H. T. McDermott, *National Secretary.*

CONSTITUTION

ARTICLE I

NAME

Section 1—The name of this organization shall be the Refrigeration Service Engineers Society.

ARTICLE II

OBJECT OF THE SOCIETY

*Section 1—The object of this Association shall be to further the education and elevation of its members in the art and science of refrigeration engineering.

Section 2—The principal means toward this end shall be the holding of meetings—national, state and local—for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery, and for social intercourse.

Section 3—Each member subscribes to the belief of identity of interests of employer and employee, and this Association shall at no time be used for the furtherance of strikes or anything that will interfere with perfect harmony between them.

Section 4 — This Association shall be non-sectarian and free from any political affiliation.

Section 5—Its meetings shall be devoted to the business of the Society and at all times preference shall be given to topics relating to the welfare, education and instruction of its members.

ARTICLE III

MOTTO

*Section 1—The motto of this Association or Society shall be

"We do it right"

ARTICLE IV

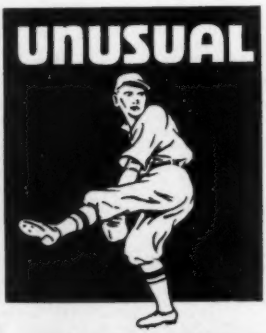
JURISDICTION

Section 1—The territorial jurisdiction of this Association shall be unlimited.

ARTICLE V

CHAPTERS AND STATE ASSOCIATIONS

*Section 1—This Association shall have power to grant charters to chapters and state associations. Charters to chapters shall be granted upon petition of ten or more members in good standing. Charters to State Associations shall be granted upon petition of two or more chapters within any state, each chapter having ten or more members in good standing.



REFRIGERATION PARTS AND SUPPLIES

FACTS IN SPORTS

PITCHING SPEED

A pitcher throws a base ball at an average speed of 150 feet per second. It takes only 2/5ths of a second for the ball to reach the batter.

Boy! That's Travelin'

But have you ever tried Borg Warner for service when you are on an emergency job and time is so important? Let us show you on that next order why more and more service men prefer to buy from us.

● *Our Catalog Is Yours for the Asking*

"Products of Experience"
BORG WARNER SERVICE PARTS CO.

BORG WARNER SERVICE PARTS CO.
Division Borg-Warner Corporation
2100 Indiana Avenue Chicago, Illinois

SECTION 2—The Refrigeration Service Engineers Society shall have and retain the power at all times to provide for the formation of new chapters, and to enact laws and regulations for the government of the National, Chapters and State Associations, and to amend, revise, or alter existing laws and regulations.

SECTION 3—Chapters and State Associations shall at all times be governed by the National Constitution and By-Laws, but each Chapter and State Association shall have the power to formulate such constitutions and by-laws as may seem advisable; provided, however, that such do not in any way conflict with the National Constitution and By-Laws, and that they be approved by the National President or Board of Directors before becoming effective.

SECTION 4—All charters for Chapters or State Associations shall be signed by the National President and attested by the National Secretary, who shall imprint thereon the seal of the National Association.

ARTICLE VI

MEMBERSHIP

*SECTION 1—This Society shall be composed of four classes of membership: certificate, active, associate and honorary members.

*SECTION 2—A certificate member is any service engineer with three years', or more, experience who has passed satisfactorily an examination as set up by the National Educational and Examining Board and who is in good standing. He will remain a certificate member as long as he is in good standing or until such time as the National Board of Directors may find him unworthy of membership in the Society.

*SECTION 3—An active member is one actively engaged in the Refrigeration Service Industry either as a contractor, a service engineer, or a shop man, and who is in good standing. He will remain an active member as long as he is in good standing, or until he passes the examination for certificate membership, or until the National Board of Directors find him unworthy of holding membership in the Society.

*SECTION 4—An associate member is any member not actively engaged in servicing but who is identified with the refrigeration industry and who is in good standing. Should an associate member at any time go into the servicing industry he may apply for active, and later certificate, membership. Associate members are subject to such rules and regulations as the By-Laws may provide and may be suspended should the National Board of Directors find them unworthy of membership.

SECTION 5—Honorary memberships may be conferred as a mark of respect or distinction on persons who have rendered eminent service to science, to refrigeration engineering, or to this Association.

ARTICLE VII

ELIGIBILITY FOR MEMBERSHIP

*SECTION 1—All white, refrigerating industry personnel of good moral character who qualify for membership as per Article VI of this Constitution are eligible for membership in this Society.

ARTICLE VIII

OFFICERS

*SECTION 1—The officers of this Society shall consist of a President, a First Vice-President, Second Vice-President, Secretary, Treasurer, and Sergeant-at-Arms. The first three officers, consisting of the President, First Vice-President and the Second Vice-President, shall be promoted in such manner that at each annual meeting the First Vice-President shall become President, and the Second Vice-President shall become First Vice-President, provided they have worked for the best interests of the Society and have conformed to and abided by its Constitution and By-Laws.

*SECTION 2—At each annual meeting a Second Vice-President, a Treasurer, a Secretary and a Sergeant-at-Arms shall be elected. Officers to be advanced or elected must be present at annual meetings when elections are held.

SECTION 3—There shall also be a Board of Advisors composed of members who are Past Presidents, the chairman of which shall be the last retired President.

ARTICLE IX

STANDING COMMITTEES

SECTION 1—There shall be the following Standing Committees and such others as may be provided for from time to time:

Educational and Examining Board
Committee on Standards
Committee of Cost Records
Investigating Committee
Membership Committee
Employment Committee
Publicity Committee
Educational Fund Committee
Committee on Legal Affairs

*SECTION 2—The National President appoints the Chairman of each committee, except the Educational Committee, the Chairman of which is elected by ballot at the annual convention.

*SECTION 3—The committee Chairmen select their own members, with the approval of the National President.

SECTION 4—The President, or Board of Directors may appoint special committees at any time.

SECTION 5—The Board of Directors may appoint a Consulting Legal Counsel, upon the recommendation of the Committee on Legal Affairs, whose term of office and remuneration for services shall be fixed by the Board of Directors.

ARTICLE X

AMENDMENTS

SECTION 1—This Constitution may be altered, amended, or a new Constitution adopted, by a vote of two-thirds of the voting members present at any annual meeting, provided due notice of the proposed change shall have been inserted in the notification calling such meeting

BY-LAWS

ARTICLE I

FISCAL YEAR

*SECTION 1—The fiscal year of this Society, as applied to membership dues, shall be from July 1 to June 30 of each year.

*SECTION 2—The yearly fiscal reports or statements of the Secretary and Treasurer shall cover the fiscal year. Other reports or statements shall be issued at other periods as called for by the Board of Directors.

SECTION 3—The Secretary and the Treasurer shall each be required to give bond in the sum of not less than five thousand ($5,000) dollars, and for as much greater amount as may be determined by the Board of Directors from time to time.

ARTICLE II

ELECTION OF MEMBERS

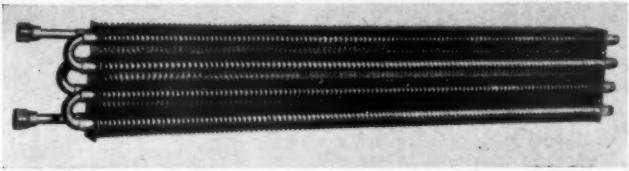
SECTION 1—Application for membership-at-large for this Association may be filed at any time with the President or Secretary, who shall then refer same to the National Membership Committee. Application for membership in a Chapter may be filed at any time through the Secretary of the Chapter nearest to the applicant's place of residence. Said Secretary shall forward all applications, or copy thereof, to the National Secretary.

SECTION 2—An applicant for membership is required to give a true account of his actual experience as a service engineer, and an agreement over his own signature that, if elected to membership, he will faithfully abide by the Constitution and By-Laws of the National Association.

*SECTION 3—Active or associate members may be elected at any annual or special meeting of the Association by a majority vote of those present, but in the interval between said meetings, application for membership, when approved by the National Educational and Examining Board, may be referred to the

ROME *Announces*

A new bulletin 110 covering
ROME FROST FREE EVAPORATORS



These compact Rome Coils can be used in many places where ordinary coils will not fit. SEND FOR YOUR COPY.

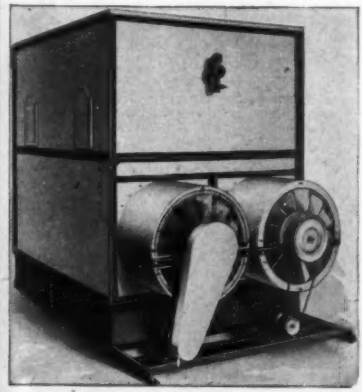
ROME WATER COOLED CONDENSERS of "tube within a tube" type are making money for service men who have opportunity of changing over inefficient air cooled installations.

ROME-TURNEY RADIATOR CO.

300 South James St. ROME, N. Y.

Makers of air heating and air cooling equipment. New air cooling bulletin now ready.

BINKS SPRAY COOLING TOWERS
Indoor Forced Draft Type Will
Save Money for You!



What happens to the circulating water after it passes through your Ice Machine Condensers?

If discharged to waste you are literally pouring good hard earned dollars down the sewer! Check your water bills . . . see how much you are throwing away. You'll be surprised.

A Binks Cooling Tower permits the constant recirculation of the required supply, cooling and using it over and over again and again, substituting a small pumping charge for the former heavy water bills.

There are more than three thousand Binks Cooling Towers now in operation including sizes for all standard commercial refrigeration units. Let us tell you more about it, and how YOU TOO can cut the water costs of your present equipment by as much as eighty per cent.

Write Today for Bulletin No. 70

BINKS MANUFACTURING CO.

3151 Carroll Ave. Windsor, Ontario-Canada CHICAGO, ILL.

Board of Directors, who may elect such applicants to membership and report such action to the next meeting of the Association.

SECTION 4—Honorary members may be elected at any annual meeting upon nomination by the Board of Directors.

ARTICLE III

INITIATION FEES AND DUES

SECTION 1—The initiation fee for members-at-large shall be $5.00, which must accompany the application for membership, and in the event that the applicant for any reason is denied membership in this Association, his initiation fee shall be returned at once.

*SECTION 2—The annual dues of members of the Society shall be $7.50 per annum, payable in advance, which sum shall include the Official Organ for the year.

*SECTION 3—Members-at-large pay the full amount of initiation fee and dues to the National Secretary.

*SECTION 4—A National per capita tax, or initiation fee, of $2.00 shall be paid by chapters for each member. This fee shall be sent to the National Secretary, accompanying each new application for membership.

*SECTION 5—Each chapter shall pay to the National Society an annual per capita tax, or dues, of $3.00 which sum shall include the Official Organ for the year. These dues are for each member in good standing and are payable in advance.

*SECTION 6—A member failing to pay annual dues on or before September 1 of each year shall not be entitled to vote or to receive the educational papers and lectures, or the Official Organ, until such time as the delinquent dues are fully paid.

ARTICLE IV

TRANSFER OF MEMBERSHIP

SECTION 1—Any member-at-large of the National Association, or member of a Chapter, who, by a change of residence, desires to affiliate with a Chapter nearest to his place of residence, shall be privileged to do so without cost by applying to the National Secretary or to the Chapter to which he belongs, and the Secretary to whom he applies shall issue to him, if a member in good standing, a letter or transfer card, which must be deposited with the Chapter with which the member desires to affiliate, within ninety days. Transfer cards must show that the member has paid all dues to the Chapter with which he was previously affiliated.

ARTICLE V

PRIVILEGES OF MEMBERS

SECTION 1—At annual and special meetings of the National Association, each Chapter shall be allowed one voting delegate and one vote to every ten members or major fraction thereof in good standing and upon whom the National per capita tax has been paid. Certificate or active members-at-large are entitled to one vote each. No member shall be permitted to vote by proxy unless he shall give prior notice, accompanied with an affidavit showing his inability to attend, which notice shall be filed with the National Secretary on or before ten days prior to any general or special election of officers or directors.

ARTICLE VI

OBLIGATIONS

SECTION 1—All members of this Association, either members-at-large or members of Chapters, are enjoined from taking part in strikes or disagreements between employees and employers as members of the organization. The National Association and Chapters are in no sense a labor organization, and their purposes and functions are entirely for the better education of their members in the art and science of refrigeration service engineering, and it shall be incumbent upon the officers and members at all times and at each and every meeting and convention to strive for the betterment of the membership and the profession.

ARTICLE VII

MEETINGS

SECTION 1—The Annual Convention of the National Association shall be held at such time and place as may be designated by the Board of Directors. The National Secretary shall send out notice of annual meetings to Chapters and members-at-large at least ninety days prior to Convention date. A special meeting of the National Association may be called at any time on notice of at least thirty (30) days, at the request of the President, or a majority of the Board of Directors. All notices of said special meetings shall state the time and place and business of said meeting, and no other business of any kind or character may be acted upon other than stated in such notice.

ARTICLE VIII

CHAPTERS AND STATE ASSOCIATIONS

SECTION 1—Chapters and State Associations may convene as often as may be desired, but shall be required to meet at least once annually. A proper report of all meetings shall be made by the Chapters or State Associations to the National Secretary.

SECTION 2—State Associations or Chapters shall not have the power to contract any debt whatever in the name of the National body, or in any manner involve it in any kind of litigation, without first obtaining the consent of the National body, or the National Board of Directors.

SECTION 3—Chapters are cautioned against admitting engineers of immoral habits, or engineers addicted to intoxicants to excess. Remember, a chain is no stronger than its weakest link. Men of immoral habits and drunkards can but weaken our Association. Solicit only good, industrious, sober engineers for the organization.

SECTION 4—Chapters should, at all times, elect alternate delegates, so that in case the regularly elected delegate is prevented from attending National meetings, the alternate may act in his stead, thus providing for full representation at all times. Alternate delegates shall be provided with credentials in the same manner as elected delegates.

SECTION 5—Delegates to the National Convention must come provided with credentials properly attested by the President and Secretary of the Chapter which they represent. Each delegate will be provided with proper credentials on forms furnished by the National Secretary. Credentials shall be mailed to the National Secretary at least ten days prior to the date set for the opening of the National Convention.

ARTICLE IX

SPECIAL OR FIELD DEPUTIES

SECTION 1—Special or field deputies may be appointed at any time by the National President, when, in his judgment, it is deemed advisable, and shall perform such special duties as the National President shall direct, such as soliciting applications for membership and the organization of Chapters. Special Deputies shall report to the National Secretary and to the National President and their commission may be revoked by the President at any time.

ARTICLE X

OFFICIAL ORGAN AND TRAINING SCHOOL

SECTION 1—The official organ of the Association shall be "The Refrigeration Service Engineer," published by Nickerson & Collins Co., Chicago, Ill., which shall be authorized to publish official notices, reports, papers and other documents of the Association.

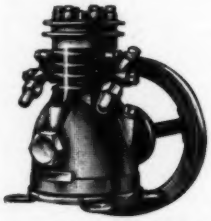
*SECTION 2—The Refrigeration Service Engineers Society, as a national organization, shall not sponsor, endorse and/or recommend any firm, organization or service.

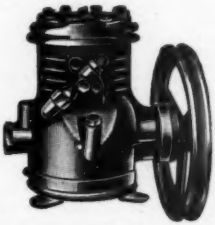
ARTICLE XI

DUTIES OF OFFICERS AND COMMITTEES

SECTION 1—The duties of the officers shall be those usually appertaining to such offices in like organizations.

"Chieftain" Quality Built Compressors and Condensing Units





See Your Jobber

For Literature and Prices on Our Complete Line

Save money by installing "Chieftain" Compressors instead of trying to satisfy exacting customers with rebuilt compressors or condensing units.

"Chieftain" Compressors are made to last. Precision limits are maintained on all parts. Our new and exclusive lubrication system insures longer life and higher efficiency, as well as a quiet operating unit.

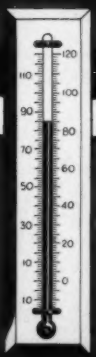
In addition to quality we offer prices that will permit you to make a higher percentage of profit as well as a saving of time, which will enable you to satisfactorily handle a larger volume of business.

TECUMSEH PRODUCTS COMPANY, Tecumseh, Michigan

Refrigeration Division

SERVICE DOESN'T FALTER WHEN IT COMES FROM HARRY ALTER

WHOLESALE ONLY



WHEN THE TEMPERATURE SOARS—
DEPEND ON US FOR FAST SERVICE

REFRIGERATION
PARTS and SUPPLIES

WRITE FOR CATALOG

SEND FOR OUR *New* CATALOG

If you are engaged in the business of servicing or selling refrigeration you should have a copy of our new 96 page SUMMER catalog. Write today on your letterhead. We sell to the trade only.

COMPLETE STOCK Carried in Our BRANCH HOUSES

The **HARRY ALTER CO., Inc.**

MAIN OFFICES 1728 S. Michigan Ave., CHICAGO, ILL.

NEW YORK CITY
161 Grand St.

CLEVELAND, OHIO
4506 Prospect Ave.

ST. LOUIS, MO.
2115 Washington Ave.

SECTION 2—The duties of the several standing committees are such as defined by their titles, or as may be defined by the By-Laws, or by the Board of Directors.

SECTION 3—Board of Advisors: It shall be the duty of the Board of Advisors to consult with and advise the National President and Board of Directors when called upon to do so, on all questions of Association policy, and other questions of importance.

*SECTION 4—The Educational and Examining Board shall have supervision of the issuing of membership certificates and shall adopt a method of examining whereby the qualifications, including experience, of an applicant for a certificate may be determined, and it shall have authority to instruct the National Secretary to issue such certificates to members in good standing who have successfully passed the examination and met the other requirements for certificate membership. Certificate so issued shall bear the current year date, and shall be good and in force for that year only, a new certificate being required and issued each year to certificate members in good standing. Examinations may be made through committees of the Chapters under supervision of the Board. The method of examination may be changed from time to time, as the judgment of this Board deems advisable, and it shall strive to keep familiar with modern machinery and methods and see that certificates are not granted to members who are not worthy of same. It shall keep the standard of members holding certificates to the highest efficiency required of successful servicing and installation engineers.

SECTION 5—The Publicity Committee shall have the supervision over all publicity of the Association, and may also supervise all Association matter published in the Official Organ.

SECTION 6—Committee on Standards: To this committee shall be referred all questions relating to the establishment of standards, and it shall be the duty of the committee to make a study of such matters and render reports from time to time.

SECTION 7—It shall be the duty of the Educational Fund Committee to devise ways and means to establish and maintain a fund that shall be set aside to be used exclusively for educational purposes, as may be recommended by the Educational and Examining Board and approved by the Board of Directors. It is also the duty of this committee to recommend annually to the Board of Directors what part of the annual dues received from all members shall be segregated from the general fund and transferred to the educational fund.

SECTION 8—No indebtedness shall be incurred on behalf of the Association by any officer or member, without the consent of the President, Treasurer and Secretary, or the Board of Directors.

ARTICLE XII

THE EMBLEM AND SEAL

SECTION 1—The emblem and seal of the Society are copyrighted and are at all times under its control, and can be used only as may be determined by the Board of Directors. The privilege of their use by any member may be withdrawn if deemed advisable by the Board of Directors. All advertising copy in which an emblem, or the name of the Society is to appear, must first be submitted to the National Secretary and receive the approval of the Board of Directors before permission can be given for its use.

ARTICLE XIII

PARLIAMENTARY RULES

SECTION 1—Roberts' Rules of Order shall decide all questions in the debates or proceedings of this Association, provided they do not conflict with the National Constitution and By-Laws.

ARTICLE XIV

AMENDMENTS

SECTION 1—These By-Laws may be altered, suspended, amended, or new By-Laws adopted by a vote of two-thirds of the members present at any annual meeting, provided due notice of the proposed change shall have been inserted in two notifications, thirty days in advance of annual meeting.

DID YOU CATCH THIS?

IN the August issue of THE REFRIGERATION SERVICE ENGINEER on page 48 is illustrated a solenoid valve. Inadvertently this cut was printed up-side-down.

PERFECTION COMPRESSOR VALVE

THE Perfection Back-Seating Compressor Valve, Seal Cap Type 49, is one of the latest items added to the line of refrigeration service parts manufactured by the Perfection Refrigeration Parts Co., Harvey, Ill.

PERFECTION COMPRESSOR VALVE

This new valve (Perfection Stock No. 491) is a very popular replacement for Frigidaire. Bolt holes drilled $11/32$ inch on $1\frac{1}{2}$ inch centers, gauge plug $\frac{1}{8}$ inch I.P.T., tube size $\frac{1}{2}$ inch.

Descriptive Bulletin No. VFI-B, covering this new item as well as several other recent additions to the complete line of Perfection Certified Parts, is now available through Perfection jobbers.

Perfection Refrigeration Parts Co. is continually adding to the line of their replacement parts and expect to have a complete stock of certified parts for every purpose.

KRAMER DESIGNS UNUSUAL ICE CUBE MAKER

AN Ice Cube Maker embodying several unusual design features was recently made up by Kramer for the Elmira Store Fixture Corporation of Elmira, New York.

The unit was built for the top bunker of an ice service box used in an Elmira cafeteria, and the requirements set forth in the order were:

(1) Maximum ice-making capacity for limited space available
(2) Quick freezing
(3) Ample box-cooling capacity
(4) Low price

No. RF54 Flare Nut Wrench

Specialized Tools by Tool Specialists

THE servicing of refrigeration equipment is a young and growing industry. The need for specialized tools has already become apparent.

Bonney has made a thorough study of the tools needed to do practically any repair job on this type of equipment. Their knowledge gained in sixty years of fine tool manufacture has been applied to the development of the most complete line of specialized Refrigeration Service Tools ever offered by one manufacturer.

The No. RF54 Flare Nut Wrench, illustrated, is an example of this specialization. The No. 136 Bonney Catalog and Handy Data Book for Mechanics list hundred of specialized tools. Your jobber has a copy for you or write us today for one. And when you buy tools, be sure to get specialized Tools by Tool Specialists.

Dept. R

BONNEY FORGE and TOOL WORKS

Allentown, Pa.

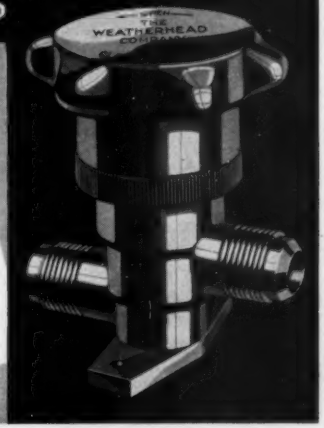
Member of Refrigeration Supplies and Parts Manufacturers Association

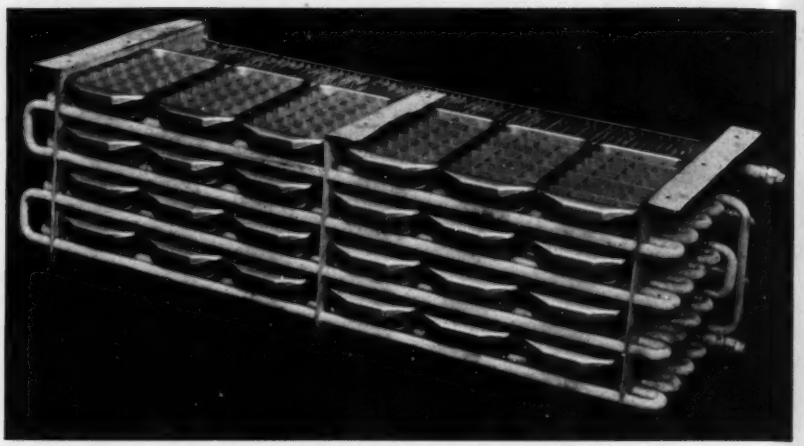
WEATHERHEAD

PACKLESS VALVES

- Sturdier construction—
- Bellows Equipped—
- Available in two and three way line and angle valves—
- Sizes range from ¼" to ⅝" in all types.

Write for our latest catalog of original equipment valves and fittings—Weatherhead Co. 820-714 Frankfort Avenue, Cleveland, Ohio.





ICE CUBE MAKER MANUFACTURED BY KRAMER

As designed by Kramer engineers, the unit consists of four shelves of ⅝ inch copper tubing on 1¼ inch centers, accommodating 24 trays, with a capacity of 2 pounds of ice per tray.

A cooling coil sufficient for the box heat loss load was mounted in the rear integrally with the ice-making coil, so as to also act as drier surface.

Because of the simplicity of its design, it was possible to fabricate the unit at a cost approximately 15 per cent lower than the cost of a similar unit made up with the conventional sheet copper shelves.

After a month's operation, reports from Elmira to the Kramer Trenton offices indicate that the ice-making capacity is more than ample and that satisfactory box temperatures are being maintained.

CLAUDE A. OLSON DIES

THE many friends of Claude A. Olson, familiarly known in the trade as "C.A." will regret to learn of his demise on Monday, August 10. Interment was held in Chicago on Friday, August 14.

Mr. Olson had gained a host of friends in the refrigeration industry, and at the time of his death was representing the Detroit Lubricator Co., Henry Valve Co., Hill Manufacturing Co., and Williams Gauge Co. in the southwestern section of the United States, making his headquarters at Fort Worth, Texas.

LEITNER REFRIGERATION SERVICE SELLING MILLS COMPRESSORS

LEITNER REFRIGERATION SERVICE of 3112 Holmes St., Kansas City, Mo., is the sales agent exclusively in Kansas City for the Mills condensing units. An attractive display of the new Mills units is being shown at their shop, 3112 Holmes St. Independent service men in Kansas City and surrounding territory are invited to inspect these new units, ranging in size from ⅓ to 7½-hp. The new Mills compressor is an ideal unit for replacement service, and is priced attractively.

SPANGLER COMPANY OPENS NEW ORLEANS STORE

THE Spangler Co., Inc., of 3331 Market St., St. Louis, of which Mr. Robt. H. Spangler is president, was one of the early pioneers in the establishment of a service parts store in St. Louis, and in extending the operation of his company to New Orleans, La., in the early part of the spring at 623 St. Charles Ave., the company is in a position to serve both of these strategic refrigeration points with one of the most com-

Protects Throat, Lungs, Eyes
HEALTHGUARD FUME KIT

Makes emergency jobs safe for refrigeration servicemen. The kit includes cartridges for sulphur dioxide, ammonia and methyl chloride. The mask has a soft moulded rubber face piece designed to adapt itself to the facial contour, sealing the interior against outside contaminated air.

CHICAGO EYE SHIELD CO.
2341 Warren Boulevard
CHICAGO, ILL.

DU PONT
Artic
REG. U. S. PAT. OFF.
(DU PONT METHYL CHLORIDE)
FOR SERVICE WORK

LOW ACIDITY . . . LOW MOISTURE

Produced under strict chemical control and PRE-TESTED before shipping. Low moisture and acidity, high purity are guaranteed.

Authorized ARTIC distributors at strategic points carry adequate stocks of ARTIC in standard containers.

Send for *ARTIC Service News*—contains current information about refrigeration, lists authorized distribution points. Copies free on request.

E. I. DU PONT DE NEMOURS & COMPANY, INC.
The R. & H. Chemicals Department **Wilmington, Delaware**

Index to Advertisements

Airo Supply Co. 42
Alco Valve Co. 1
Alter Co., The Harry 59
American Brass Co. 4
American Injector Co. 41
Ansul Chemical Co. 51
Automatic Products Co. 41

Binks Manufacturing Co. 57
Blythe Co., H. W. 48
Bonney Forge & Tool Wks. 61
Borg-Warner Service Parts Co. 55
Burstein-Applebee Co. 44

Channon Co., H. 40
Chicago Eye Shield Co. 63
Chicago-Wilcox Mfg. Co. 40
Cutler-Hammer, Inc. 2

Detroit Lubricator Co. 6

Fedders Manufacturing Co. ..... 32 and 33
Frigidaire Corp. 3

Henry Valve Co. 46
Herkimer Institute of Refrigeration 41

Ideal Commutator Dresser Co. 48

Jarrow Products Corp. 44

Miller Rubber Co. 50
Mills Novelty Co. 54
Minneapolis-Honeywell Regulator Co. ..... Back Cover
Mullin, Colman J. 44

Peerless Ice Machine Co. 43
Perfection Refrigeration Parts Co. ..... Inside Back Cover
Practical Instrument Co. 00

Ranco, Inc. 43
R. & H. Chemicals Dept. 63
Refrigeration Products, Inc. 44
Rempe Co. 47
Rome-Turney Radiator Co. 57
Rotary Seal Co. ..... Inside Front Cover

Schneider Co., Carl 40
Scurlock Kontanerette Corp. 47
Shank Co., Cyrus 41
Spangler Co., Inc., The 43
Stangard Products Corp. 42
Starr Co., The 40

Tecumseh Products Co. 59
Trenton Auto Radiator Works 48

Utilities Engineering Institute 48

Virginia Smelting Co. 48

Weatherhead Co. 61

plete lines of refrigeration supplies and equipment.

The New Orleans store is capably managed by Mr. C. H. Boyd, who was formerly connected with the Alco Valve Co. of St. Louis.

Mr. Spangler has built the business on the theory that a parts distributor should be in a position, through the carrying of complete stocks as well as a capable and well-trained organization, to give prompt and efficient service on the many items that the service engineer requires.

To bring together a closer relationship between the customer and the Spangler organization, a new catalog has been prepared, completely illustrating the stocks that are maintained in both of these stores. The Spangler Company prides itself on what are to be considered the two largest stocks of hard copper pipe and fittings for the air conditioning trade in both their New Orleans and St. Louis territories. This is of especial interest to contractors doing air conditioning work. Air conditioning pipe is stocked in 20 ft. straight lengths with both ends capped to insure cleanliness upon its arrival on the job. Also included in the air conditioning stock is a complete line of wrought or copper fittings up to and including 4 inches in size. Copper pipe is also carried in stock up to and including this size in Government Specification Types I. and M.

S S S

PATENT INFRINGEMENT SUIT

SUIT for infringement of the Cooke Seal Ring Patent No. 1,869,933 has been filed against Aero Products Corporation and is now pending before the United States District Court, Southern District of New York, under Equity No. 83-163. The suit is brought by Cooke Electric Refrigeration Company, the patent owner, and by Rotary Seal Company of Chicago, the exclusive manufacturing licensee.

S S S

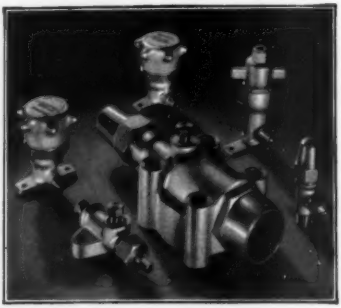
NEW VIRGINIA SMELTING DISTRIBUTORS

J. W. Edgerly & Co., Ottumwa, Ia., now carry stocks of Virginia Smelting Co.'s sulphur dioxide and methyl chloride for immediate service to the refrigeration industry in this territory. Additional stock points have been established at the following places: Machine Tool & Supply Co., 215 E. Second St., Tulsa, Okla., Refrigeration Supplies Distributor, 202-4-6 22nd St., So. Birmingham, Ala., Radio Supply, Inc., 46 Exchange St., Salt Lake City, Utah.

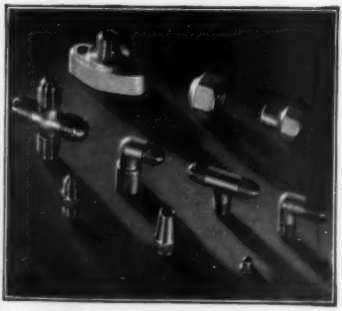
PERFECTION

Refrigeration Parts Are ACCURATE

COMPRESSOR PARTS



VALVES



FITTINGS

The enviable reputation of Perfection Products is traceable to their *accuracy* and to their outstanding performance in service.

Perfection has always maintained a policy of manufacturing products that *excel*. So well has Perfection achieved the ideal of accuracy and excellence, that throughout the country aggressive service engineers associate satisfied customers and a growing business with the name Perfection.

Today the symbol of Perfection is universally recognized as assurance of skilled engineering, the use of best suited materials and precision workmanship.

Leading jobbers of refrigeration parts stock this complete line, and are prepared to make immediate deliveries.

Perfection resources, energies and skill are reflected in this complete line of refrigeration parts—all certified to excel.

Service engineers quickly note the superiority of these parts that are held to exacting tolerances to insure *ease of installation, perfect fit, quietness of operation* and *long, dependable service.*

This popular line includes VALVES, FITTINGS, TOOLS, and COMPRESSOR PARTS. The compressor parts are not limited to a single make, but are available for Copeland, Frigidaire, Kelvinator, Servel, Universal, Zerozone and others.

Be sure to look for the seal of Perfection when you buy. There is an authorized jobber near you who displays this emblem.

THE MARK OF PERFECTION CERTIFIED PARTS

PERFECTION REFRIGERATION PARTS COMPANY

(A division of the Perfection Gear Company. Established 1919)

HARVEY, ILLINOIS

SAVE TIME

ON COMFORT COOLING AND REFRIGERATIO INSTALLATIONS

Standardize ON MINNEAPOLIS HONEYWELL CONTROLS FOR Every Job

Combination Temperature and Humidity Control

Duct Tempe Control

Modutrol Damper Motor

Refrigeration Pressure Control

WHEN you standardize on Minneapolis-Honeywell controls for refrigeration or air conditioning installations you benefit in many ways. First, you are using the finest controls available. Second, you have to stock only one line of controls. Third, you reduce installation and service costs because Minneapolis-Honeywell controls are easier to adjust and install. It will pay you to install Minneapolis-Honeywell controls on every job. Dependable controls cost less than service . . . Minneapolis-Honeywell Regulator Co., 2934 Fourth Avenue South, Minneapolis, Minnesota.

MINNEAPOLIS-HONEYWEL

Control Systems

BROWN INSTRUMENTS FO

GATING, RECORDING AND CONTROLLIN